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## Supplementary Information

### **Pre-conception and prenatal alcohol exposure from mothers and fathers drinking and head circumference: results from the Norwegian Mother-Child Study (MoBa).**

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#### **Table of contents**

|  |    |
|--|----|
| Description of confounders -alcohol associations .....   | 2  |
| Description of confounders -out comes associations ..... | 3  |
| T ABLES AND FIGURES .....                                | 4  |
| Alcohol drinking p at terns.....                         | 4  |
| Alcohol-Confounders associations .....                   | 6  |
| Confounders-Out comes associations .....                 | 20 |
| Sensit ivit y analy ses .....                            | 22 |

## Description of confounders-alcohol associations

Confounders-alcohol associations were similar or very similar for mothers and fathers (with a few exceptions), with maternal characteristics more strongly associated with maternal drinking and vice versa, and directions of association as expected (Supplementary Information, Tables S7-S10, Figures S1 and S2).

For maternal drinking before pregnancy, the shape of association was often curvilinear (U, J or inverse U and J), so often non-drinkers and heavier drinkers were more like each other, and differed from light-to-moderate drinkers (drinking 1-2 drinks per occasion), in particular in terms of socioeconomic factors (Supplementary Information, Table S7). The latter was the

category most likely to be taking folic acid supplements, to have planned the pregnancy, to be recruited earlier, to have taller partners with lower BMI, and both themselves and their partners were more likely to be older, better educated, and earning more. Where confounders-alcohol relationship was monotonic, increasing alcohol use was associated with no previous pregnancies, Norwegian ethnic origin, no financial strains, increased smoking and drug taking in pregnancy (maternal and paternal).

Paternal drinking before pregnancy was less obviously associated with maternal pre-pregnancy BMI and gross income, or paternal height, compared to maternal drinking (Supplementary Information, Tables S7 and S8, Figure S1).

Most women quit drinking in the first trimester of pregnancy or markedly reduced their alcohol intake (Supplementary Information, Tables S4 and S9). The biggest differences compared to before pregnancy were in the patterning of maternal drinking in association with planned pregnancy, which went from U-shaped to monotonic), and with maternal smoking in pregnancy, folic acid and financial strain, which went from showing some to no association (Supplementary Information, Tables S7 and S9, Figures S1 and S2).

Paternal drinking patterns of association were very stable before-during pregnancy

(Supplementary Information, Tables S8 Vs S10). The patterning of alcohol drinking during pregnancy in association with most confounders was very similar for mothers and fathers, with the exception of maternal ethnic background and education, and maternal and paternal age and smoking during pregnancy, and paternal age (Supplementary Information, Figure S2).

### **Description of confounders-outcomes associations**

There was evidence of association with offspring head circumference at birth for most of the potential confounders identified, the only exceptions being financial strain and planned pregnancy (Supplementary Information, Tables S11 Vs S12). The strength and direction of associations were similar for the outcome at 3 months, except for maternal and paternal education and gross income, which went from an inverse U shape, with babies of parents at both ends of the education and income spectrum having smaller head circumferences compared to babies born to parents in the middle of the spectrum, to a positive trend, with increasing head size for increasing education levels and wealth (Supplementary Information, Tables S11 Vs S12), possibly suggesting catch-up growth for children of richer, better educated parents. The other difference was for folic acid use, which went from a negative association with head circumference at birth to a borderline positive association at 3 months. Breech fetal presentation predicts larger head circumference at birth but the correlation is less strong for head circumference measured 3 months, which was the motivation for repeating all analyses with the outcome measured at 3 months, to overcome at least some of the bias potentially caused by this association.

## TABLES AND FIGURES

### Alcohol drinking patterns

Supplementary Information, Table S1. Maternal Vs paternal alcohol intake before pregnancy (units per occasion) – correlation coefficients.

|     | 0      | <1     | 1-2    | 3-4    | 5+     |
|-----|--------|--------|--------|--------|--------|
| 0   | 0.448  | 0.025  | -0.071 | -0.106 | -0.102 |
| <1  | 0.091  | 0.075  | 0.032  | -0.054 | -0.064 |
| 1-2 | -0.014 | 0.048  | 0.235  | -0.052 | -0.205 |
| 3-4 | -0.079 | -0.021 | 0.055  | 0.095  | -0.101 |
| 5+  | -0.138 | -0.070 | -0.253 | 0.030  | 0.352  |

Supplementary Information, Table S2. Maternal Vs paternal alcohol intake during 1st trimester of pregnancy (units per occasion) – correlation coefficients.

|     | 0      | <1     | 1-2    | 3-4    | 5+     |
|-----|--------|--------|--------|--------|--------|
| 0   | 0.111  | -0.072 | -0.052 | -0.033 | -0.028 |
| <1  | 0.062  | -0.036 | -0.031 | -0.022 | -0.017 |
| 1-2 | -0.005 | 0.035  | 0.019  | -0.034 | -0.062 |
| 3-4 | -0.052 | 0.046  | 0.035  | 0.006  | -0.025 |
| 5+  | -0.031 | -0.025 | -0.011 | 0.055  | 0.106  |

Supplementary Information, Table S3. Paternal alcohol intake before Vs during 1st trimester of pregnancy (units per occasion) – correlation coefficients.

|     | 0      | <1     | 1-2    | 3-4    | 5+     |
|-----|--------|--------|--------|--------|--------|
| 0   | 0.895  | 0.052  | -0.123 | -0.126 | -0.157 |
| <1  | -0.044 | 0.764  | -0.052 | -0.123 | -0.173 |
| 1-2 | -0.134 | -0.149 | 0.859  | -0.241 | -0.455 |
| 3-4 | -0.118 | -0.135 | -0.356 | 0.828  | -0.311 |
| 5+  | -0.141 | -0.162 | -0.430 | -0.408 | 0.900  |

Supplementary Information, Table S4. Maternal alcohol intake before Vs during 1st trimester of pregnancy (units per occasion) – correlation coefficients.

|     | 0      | <1     | 1-2    | 3-4    | 5+     |
|-----|--------|--------|--------|--------|--------|
| 0   | 0.184  | 0.074  | 0.021  | -0.099 | -0.063 |
| <1  | -0.120 | -0.024 | 0.052  | 0.060  | -0.034 |
| 1-2 | -0.088 | -0.053 | 0.024  | 0.080  | -0.034 |
| 3-4 | -0.052 | -0.033 | -0.111 | 0.083  | 0.076  |
| 5+  | -0.047 | -0.029 | -0.103 | -0.086 | 0.241  |

Supplementary Information, Table S5. Maternal alcohol intake during 1st Vs 2nd trimester of pregnancy (units per occasion) -- correlation coefficients.

|     | 0      | <1     | 1-2    | 3-4    | 5+     |
|-----|--------|--------|--------|--------|--------|
| 0   | 0.431  | -0.343 | -0.237 | -0.028 | 0.001  |
| <1  | -0.365 | 0.393  | 0.085  | 0.004  | -0.012 |
| 1-2 | -0.208 | -0.006 | 0.316  | 0.040  | 0.012  |
| 3-4 | -0.027 | -0.008 | 0.009  | 0.053  | 0.022  |
| 5+  | -0.014 | -0.006 | -0.004 | 0.013  | 0.049  |

Supplementary Information, Table S6. Maternal alcohol intake during 2nd Vs 3rd trimester of pregnancy (units per occasion) -- correlation coefficients.

|     | 0      | <1     | 1-2    | 3-4    | 5+     |
|-----|--------|--------|--------|--------|--------|
| 0   | 0.716  | -0.610 | -0.343 | -0.032 | -0.014 |
| <1  | -0.525 | 0.603  | -0.011 | -0.007 | -0.004 |
| 1-2 | -0.443 | 0.171  | 0.571  | 0.013  | -0.003 |
| 3-4 | -0.051 | 0.023  | 0.021  | 0.260  | 0.034  |
| 5+  | -0.013 | -0.003 | 0.012  | 0.029  | 0.203  |

## Alcohol-Confounders associations

Supplementary Information, Table S7. Association between confounders and maternal alcohol before pregnancy (in units/occasion) – numbers (%).

|  | Total | 0 units/occasion | <1          | 1-2           | 3-4           | 5+            |
|--|-------|------------------|-------------|---------------|---------------|---------------|
| Year of birth                            |       |                  |             |               |               |               |
| 1999-2003                                | 12593 | 1094 (8.69)      | 428 (3.40)  | 3727 (29.60)  | 4024 (31.95)  | 3320 (26.36)  |
| 2004-2005                                | 20687 | 1751 (8.46)      | 710 (3.43)  | 6377 (30.83)  | 6317 (30.54)  | 5532 (26.74)  |
| 2006-2007                                | 23196 | 1781 (7.68)      | 772 (3.33)  | 7492 (32.30)  | 7200 (31.04)  | 5951 (25.66)  |
| 2008-2009                                | 11622 | 833 (7.17)       | 368 (3.17)  | 3984 (34.28)  | 3600 (30.98)  | 2837 (24.41)  |
| Fetal presentation                       |       |                  |             |               |               |               |
| Normal cephalic                          | 61872 | 4993 (8.07)      | 2090 (3.38) | 19720 (31.87) | 19130 (30.92) | 15939 (25.76) |
| Breech                                   | 2503  | 167 (6.67)       | 75 (3.00)   | 722 (28.85)   | 859 (34.32)   | 680 (27.17)   |
| Transverse                               | 152   | 20 (13.16)       | 1 (0.66)    | 64 (42.11)    | 41 (26.97)    | 26 (17.11)    |
| Abnormal cephalic                        | 3026  | 233 (7.70)       | 95 (3.14)   | 884 (29.21)   | 944 (31.20)   | 870 (28.75)   |
| Birth weight (g)                         |       |                  |             |               |               |               |
| <2500                                    | 1334  | 120 (9.00)       | 50 (3.75)   | 344 (25.79)   | 439 (32.91)   | 381 (28.56)   |
| 2500-2999                                | 5882  | 480 (8.16)       | 201 (3.42)  | 1729 (29.39)  | 1918 (32.61)  | 1554 (26.42)  |
| 3000-3499                                | 20035 | 1598 (7.98)      | 664 (3.31)  | 6351 (31.70)  | 6285 (31.37)  | 5137 (25.64)  |
| 3500-3999                                | 25758 | 2012 (7.81)      | 862 (3.35)  | 8275 (32.13)  | 7940 (30.83)  | 6669 (25.89)  |
| 4000+                                    | 15089 | 1249 (8.28)      | 501 (3.32)  | 4881 (32.35)  | 4559 (30.21)  | 3899 (25.84)  |
| Folic acid use around conception         |       |                  |             |               |               |               |
| No                                       | 16126 | 1605 (9.95)      | 612 (3.80)  | 4401 (27.29)  | 4726 (29.31)  | 4782 (29.65)  |
| Yes                                      | 49852 | 3622 (7.27)      | 1577 (3.16) | 16609 (33.32) | 15785 (31.66) | 12259 (24.59) |
| Planned pregnancy                        |       |                  |             |               |               |               |
| No                                       | 11621 | 1043 (8.98)      | 406 (3.49)  | 2963 (25.50)  | 3242 (27.90)  | 3967 (34.14)  |
| Yes                                      | 55734 | 4326 (7.76)      | 1839 (3.30) | 18410 (33.03) | 17682 (31.73) | 13477 (24.18) |
| Parity                                   |       |                  |             |               |               |               |
| 0  | 32191 | 1932 (6.00)      | 827 (2.57)  | 8003 (24.86)  | 10657 (33.11) | 10772 (33.46) |
| 1+                                       | 34998 | 3438 (9.82)      | 1420 (4.06) | 13333 (38.10) | 10217 (29.19) | 6590 (18.83)  |
| Ethnic background                        |       |                  |             |               |               |               |
| Norwegian                                | 56229 | 4057 (7.22)      | 1681 (2.99) | 17401 (30.95) | 17713 (31.50) | 15377 (27.35) |
| Other                                    | 10599 | 1308 (12.34)     | 544 (5.13)  | 3844 (36.27)  | 3047 (28.75)  | 1856 (17.51)  |
| Financial strain                         |       |                  |             |               |               |               |
| Yes                                      | 39280 | 3404 (8.67)      | 1349 (3.43) | 12937 (32.94) | 12163 (30.96) | 9427 (24.00)  |
| No                                       | 27597 | 1899 (6.88)      | 869 (3.15)  | 8283 (30.01)  | 8642 (31.31)  | 7904 (28.64)  |
| Maternal age (years)                     |       |                  |             |               |               |               |
| <25                                      | 8285  | 807 (9.74)       | 278 (3.36)  | 1197 (14.45)  | 1794 (21.65)  | 4209 (50.80)  |
| 25-29                                    | 24270 | 2012 (8.29)      | 703 (2.90)  | 6267 (25.82)  | 7554 (31.12)  | 7734 (31.87)  |
| 30-34                                    | 25626 | 1837 (7.17)      | 850 (3.32)  | 9722 (37.94)  | 8579 (33.48)  | 4638 (18.10)  |
| 35+                                      | 9917  | 803 (8.10)       | 447 (4.51)  | 4394 (44.31)  | 3214 (32.41)  | 1059 (10.68)  |
| Maternal height (cm)                     |       |                  |             |               |               |               |
| <164                                     | 14874 | 1576 (10.60)     | 595 (4.00)  | 4701 (31.61)  | 4281 (28.78)  | 3721 (25.02)  |
| 164-167                                  | 14526 | 1179 (8.12)      | 504 (3.47)  | 4653 (32.03)  | 4460 (30.70)  | 3730 (25.68)  |
| 168-171                                  | 18317 | 1347 (7.35)      | 536 (2.93)  | 5724 (31.25)  | 5845 (31.91)  | 4865 (26.56)  |
| 172+                                     | 19662 | 1282 (6.52)      | 606 (3.08)  | 6291 (32.00)  | 6353 (32.31)  | 5130 (26.09)  |
| Maternal pre-preg BMI (kg/m2)            |       |                  |             |               |               |               |
| <20                                      | 8426  | 775 (9.20)       | 355 (4.21)  | 3033 (36.00)  | 2414 (28.65)  | 1849 (21.94)  |
| 20-24                                    | 37171 | 2728 (7.34)      | 1142 (3.07) | 12233 (32.91) | 12048 (32.41) | 9020 (24.27)  |
| 25-29                                    | 14437 | 1199 (8.31)      | 447 (3.10)  | 4075 (28.23)  | 4392 (30.42)  | 4324 (29.95)  |
| 30-35                                    | 4648  | 404 (8.69)       | 177 (3.81)  | 1273 (27.39)  | 1372 (29.52)  | 1422 (30.59)  |
| 35+                                      | 1669  | 178 (10.67)      | 79 (4.73)   | 435 (26.06)   | 436 (26.12)   | 541 (32.41)   |
| Maternal gross income                    |       |                  |             |               |               |               |
| <150k                                    | 11218 | 1548 (13.80)     | 515 (4.59)  | 2843 (25.34)  | 2729 (24.33)  | 3583 (31.94)  |
| 150-199k                                 | 6782  | 735 (10.84)      | 247 (3.64)  | 1835 (27.06)  | 1863 (27.47)  | 2102 (30.99)  |
| 200-299k                                 | 22183 | 1698 (7.65)      | 745 (3.36)  | 6769 (30.51)  | 6750 (30.43)  | 6221 (28.04)  |
| 300-399k                                 | 17525 | 862 (4.92)       | 450 (2.57)  | 6304 (35.97)  | 6162 (35.16)  | 3747 (21.38)  |
| 400k+                                    | 8144  | 315 (3.87)       | 203 (2.49)  | 3164 (38.85)  | 3042 (37.35)  | 1420 (17.44)  |
| Maternal education                       |       |                  |             |               |               |               |
| High school (not completed)              | 4770  | 670 (14.05)      | 217 (4.55)  | 958 (20.08)   | 1097 (23.00)  | 1828 (38.32)  |
| High school (completed)                  | 17744 | 1528 (8.61)      | 670 (3.78)  | 3927 (22.13)  | 4870 (27.45)  | 6749 (38.04)  |
| College level                            | 27941 | 2203 (7.88)      | 809 (2.90)  | 9177 (32.84)  | 9214 (32.98)  | 6538 (23.40)  |
| Postgraduate level                       | 16226 | 931 (5.74)       | 533 (3.28)  | 7120 (43.88)  | 5511 (33.96)  | 2131 (13.13)  |
| Maternal smoking in pregnancy (cigs/day) |       |                  |             |               |               |               |

|  |       |             |             |               |               |               |
|--|-------|-------------|-------------|---------------|---------------|---------------|
| Non smoker                               | 64265 | 5242 (8.16) | 2179 (3.39) | 20915 (32.54) | 20125 (31.32) | 15804 (24.59) |
| <2                                       | 1711  | 79 (4.62)   | 38 (2.22)   | 298 (17.42)   | 495 (28.93)   | 801 (46.81)   |
| 2-4                                      | 452   | 21 (4.65)   | 10 (2.21)   | 62 (13.72)    | 117 (25.88)   | 242 (53.54)   |
| 4+                                       | 1266  | 82 (6.48)   | 32 (2.53)   | 182 (14.38)   | 286 (22.59)   | 684 (54.03)   |
| Maternal drugs use in pregnancy          |       |             |             |               |               |               |
| No                                       | 56991 | 4827 (8.47) | 2030 (3.56) | 18925 (33.21) | 17550 (30.79) | 13659 (23.97) |
| Yes                                      | 109   | 6 (5.50)    | 3 (2.75)    | 10 (9.17)     | 21 (19.27)    | 69 (63.30)    |
| Paternal age (years)                     |       |             |             |               |               |               |
| <25                                      | 3103  | 278 (8.96)  | 108 (3.48)  | 419 (13.50)   | 620 (19.98)   | 1678 (54.08)  |
| 25-29                                    | 15543 | 1324 (8.52) | 442 (2.84)  | 3339 (21.48)  | 4496 (28.93)  | 5942 (38.23)  |
| 30-34                                    | 27108 | 1938 (7.15) | 834 (3.08)  | 8787 (32.41)  | 8914 (32.88)  | 6635 (24.48)  |
| 35+                                      | 22322 | 1917 (8.59) | 893 (4.00)  | 9031 (40.46)  | 7106 (31.83)  | 3375 (15.12)  |
| Paternal height (cm)                     |       |             |             |               |               |               |
| <178                                     | 16269 | 1573 (9.67) | 561 (3.45)  | 4857 (29.85)  | 4848 (29.80)  | 4430 (27.23)  |
| 178-180                                  | 14756 | 1171 (7.94) | 510 (3.46)  | 4788 (32.45)  | 4548 (30.82)  | 3739 (25.34)  |
| 181-185                                  | 18224 | 1308 (7.18) | 609 (3.34)  | 5862 (32.17)  | 5687 (31.21)  | 4758 (26.11)  |
| 186+                                     | 17763 | 1297 (7.30) | 560 (3.15)  | 5771 (32.49)  | 5738 (32.30)  | 4397 (24.75)  |
| Paternal BMI (kg/m2)                     |       |             |             |               |               |               |
| <25                                      | 29262 | 2376 (8.12) | 937 (3.20)  | 9858 (33.69)  | 9003 (30.77)  | 7088 (24.22)  |
| 25-29                                    | 30208 | 2247 (7.44) | 992 (3.28)  | 9353 (30.96)  | 9594 (31.76)  | 8022 (26.56)  |
| 30-35                                    | 5819  | 539 (9.26)  | 233 (4.00)  | 1600 (27.50)  | 1742 (29.94)  | 1705 (29.30)  |
| 35+                                      | 976   | 114 (11.68) | 55 (5.64)   | 238 (24.39)   | 263 (26.95)   | 306 (31.35)   |
| Paternal gross income                    |       |             |             |               |               |               |
| <150k                                    | 4227  | 560 (13.25) | 178 (4.21)  | 1027 (24.30)  | 1093 (25.86)  | 1369 (32.39)  |
| 150-199K                                 | 2579  | 328 (12.72) | 106 (4.11)  | 653 (25.32)   | 691 (26.79)   | 801 (31.06)   |
| 200-299k                                 | 13446 | 1323 (9.84) | 483 (3.59)  | 3527 (26.23)  | 3882 (28.87)  | 4231 (31.47)  |
| 300-399k                                 | 21802 | 1623 (7.44) | 696 (3.19)  | 6862 (31.47)  | 6761 (31.01)  | 5860 (26.88)  |
| 400k+                                    | 23157 | 1257 (5.43) | 706 (3.05)  | 8730 (37.70)  | 7932 (34.25)  | 4532 (19.57)  |
| Paternal education                       |       |             |             |               |               |               |
| High school (not completed)              | 6745  | 743 (11.02) | 275 (4.08)  | 1470 (21.79)  | 1715 (25.43)  | 2542 (37.69)  |
| High school (completed)                  | 25489 | 2101 (8.24) | 858 (3.37)  | 6244 (24.50)  | 7309 (28.68)  | 8977 (35.22)  |
| College level                            | 18593 | 1456 (7.83) | 568 (3.05)  | 6424 (34.55)  | 6330 (34.05)  | 3815 (20.52)  |
| Postgraduate level                       | 16444 | 1075 (6.54) | 545 (3.31)  | 7199 (43.78)  | 5545 (33.72)  | 2080 (12.65)  |
| Paternal smoking in pregnancy (cigs/day) |       |             |             |               |               |               |
| Non smoker                               | 51795 | 4434 (8.56) | 1841 (3.55) | 17857 (34.48) | 16167 (31.21) | 11496 (22.20) |
| <5                                       | 7327  | 380 (5.19)  | 162 (2.21)  | 1866 (25.47)  | 2468 (33.68)  | 2451 (33.45)  |
| 5-10                                     | 1122  | 79 (7.04)   | 40 (3.57)   | 273 (24.33)   | 303 (27.01)   | 427 (38.06)   |
| 10+                                      | 6956  | 476 (6.84)  | 205 (2.95)  | 1368 (19.67)  | 1923 (27.65)  | 2984 (42.90)  |
| Paternal drugs use in pregnancy          |       |             |             |               |               |               |
| No                                       | 54621 | 4889 (8.95) | 1991 (3.65) | 18105 (33.15) | 16596 (30.38) | 13040 (23.87) |
| Yes                                      | 360   | 7 (1.94)    | 2 (0.56)    | 53 (14.72)    | 136 (37.78)   | 162 (45.00)   |



Supplementary Information, Table S8. Association between confounders and paternal alcohol before pregnancy (in units/occasion) – numbers (%).

|  | Total | 0           | <1          | 1-2           | 3-4           | 5+            |
|--|-------|-------------|-------------|---------------|---------------|---------------|
| Year of birth                            |       |             |             |               |               |               |
| 1999-2003                                | 12593 | 532 (4.22)  | 219 (1.74)  | 3617 (28.72)  | 3497 (27.77)  | 4728 (37.54)  |
| 2004-2005                                | 20687 | 856 (4.14)  | 299 (1.45)  | 6356 (30.72)  | 5569 (26.92)  | 7607 (36.77)  |
| 2006-2007                                | 23196 | 891 (3.84)  | 1945 (8.39) | 5988 (25.81)  | 5787 (24.95)  | 8585 (37.01)  |
| 2008-2009                                | 11622 | 424 (3.65)  | 1072 (9.22) | 2938 (25.28)  | 2792 (24.02)  | 4396 (37.82)  |
| Fetal presentation                       |       |             |             |               |               |               |
| Normal cephalic                          | 61872 | 2463 (3.98) | 3246 (5.25) | 17270 (27.91) | 15993 (25.85) | 22900 (37.01) |
| Breech                                   | 2503  | 76 (3.04)   | 129 (5.15)  | 644 (25.73)   | 674 (26.93)   | 980 (39.15)   |
| Transverse                               | 152   | 7 (4.61)    | 10 (6.58)   | 44 (28.95)    | 40 (26.32)    | 51 (33.55)    |
| Anomalous cephalic                       | 3026  | 136 (4.49)  | 135 (4.46)  | 758 (25.05)   | 805 (26.60)   | 1192 (39.39)  |
| Birth weight (g)                         |       |             |             |               |               |               |
| <2500                                    | 1334  | 46 (3.45)   | 67 (5.02)   | 331 (24.81)   | 312 (23.39)   | 578 (43.33)   |
| 2500-2999                                | 5882  | 250 (4.25)  | 317 (5.39)  | 1560 (26.52)  | 1426 (24.24)  | 2329 (39.60)  |
| 3000-3499                                | 20035 | 784 (3.91)  | 1033 (5.16) | 5477 (27.34)  | 5212 (26.01)  | 7529 (37.58)  |
| 3500-3999                                | 25758 | 1000 (3.88) | 1360 (5.28) | 7158 (27.79)  | 6667 (25.88)  | 9573 (37.17)  |
| 4000+                                    | 15089 | 623 (4.13)  | 758 (5.02)  | 4373 (28.98)  | 4028 (26.69)  | 5307 (35.17)  |
| Folic acid use around conception         |       |             |             |               |               |               |
| No                                       | 16126 | 778 (4.82)  | 686 (4.25)  | 4294 (26.63)  | 4049 (25.11)  | 6319 (39.19)  |
| Yes                                      | 49852 | 1812 (3.63) | 2747 (5.51) | 14012 (28.11) | 13065 (26.21) | 18216 (36.54) |
| Planned pregnancy                        |       |             |             |               |               |               |
| No                                       | 11621 | 479 (4.12)  | 612 (5.27)  | 2849 (24.52)  | 2615 (22.50)  | 5066 (43.59)  |
| Yes                                      | 55734 | 2177 (3.91) | 2884 (5.17) | 15845 (28.43) | 14839 (26.62) | 19989 (35.87) |
| Parity                                   |       |             |             |               |               |               |
| 0  | 32191 | 1132 (3.52) | 1339 (4.16) | 6934 (21.54)  | 7909 (24.57)  | 14877 (46.21) |
| 1+                                       | 34998 | 1523 (4.35) | 2157 (6.16) | 11743 (33.55) | 9510 (27.17)  | 10065 (28.76) |
| Ethnic background                        |       |             |             |               |               |               |
| Norwegian                                | 56229 | 1954 (3.48) | 2764 (4.92) | 15252 (27.12) | 14627 (26.01) | 21632 (38.47) |
| Other                                    | 10599 | 699 (6.59)  | 710 (6.70)  | 3321 (31.33)  | 2703 (25.50)  | 3166 (29.87)  |
| Financial strain                         |       |             |             |               |               |               |
| Yes                                      | 39280 | 1650 (4.20) | 2002 (5.10) | 11235 (28.60) | 10348 (26.34) | 14045 (35.76) |
| No                                       | 27597 | 964 (3.49)  | 1460 (5.29) | 7324 (26.54)  | 7009 (25.40)  | 10840 (39.28) |
| Maternal age (years)                     |       |             |             |               |               |               |
| <25                                      | 8285  | 441 (5.32)  | 404 (4.88)  | 1352 (16.32)  | 1466 (17.69)  | 4622 (55.79)  |
| 25-29                                    | 24270 | 1028 (4.24) | 1189 (4.90) | 5817 (23.97)  | 5863 (24.16)  | 10373 (42.74) |
| 30-34                                    | 25626 | 843 (3.29)  | 1321 (5.15) | 8147 (31.79)  | 7392 (28.85)  | 7923 (30.92)  |
| 35+                                      | 9917  | 391 (3.94)  | 621 (6.26)  | 3583 (36.13)  | 2924 (29.48)  | 2398 (24.18)  |
| Maternal height (cm)                     |       |             |             |               |               |               |
| <164                                     | 14874 | 726 (4.88)  | 837 (5.63)  | 4130 (27.77)  | 3676 (24.71)  | 5505 (37.01)  |
| 164-167                                  | 14526 | 548 (3.77)  | 837 (5.76)  | 4001 (27.54)  | 3728 (25.66)  | 5412 (37.26)  |
| 168-171                                  | 18317 | 714 (3.90)  | 890 (4.86)  | 4998 (27.29)  | 4829 (26.36)  | 6886 (37.59)  |
| 172+                                     | 19662 | 670 (3.41)  | 942 (4.79)  | 5569 (28.32)  | 5222 (26.56)  | 7259 (36.92)  |
| Maternal pre-preg BMI (kg/m2)            |       |             |             |               |               |               |
| <20                                      | 8426  | 357 (4.24)  | 470 (5.58)  | 2347 (27.85)  | 2128 (25.26)  | 3124 (37.08)  |
| 20-24                                    | 37171 | 1394 (3.75) | 1782 (4.79) | 10336 (27.81) | 9798 (26.36)  | 13861 (37.29) |
| 25-29                                    | 14437 | 545 (3.78)  | 772 (5.35)  | 3978 (27.55)  | 3731 (25.84)  | 5411 (37.48)  |
| 30-35                                    | 4648  | 224 (4.82)  | 292 (6.28)  | 1285 (27.65)  | 1177 (25.32)  | 1670 (35.93)  |
| 35+                                      | 1669  | 81 (4.85)   | 138 (8.27)  | 456 (27.32)   | 376 (22.53)   | 618 (37.03)   |
| Maternal gross income                    |       |             |             |               |               |               |
| <150k                                    | 11218 | 765 (6.82)  | 647 (5.77)  | 2788 (24.85)  | 2330 (20.77)  | 4688 (41.79)  |
| 150-199k                                 | 6782  | 367 (5.41)  | 364 (5.37)  | 1808 (26.66)  | 1585 (23.37)  | 2658 (39.19)  |
| 200-299k                                 | 22183 | 834 (3.76)  | 1064 (4.80) | 6280 (28.31)  | 5686 (25.63)  | 8319 (37.50)  |
| 300-399k                                 | 17525 | 426 (2.43)  | 961 (5.48)  | 5000 (28.53)  | 5010 (28.59)  | 6128 (34.97)  |
| 400k+                                    | 8144  | 150 (1.84)  | 361 (4.43)  | 2392 (29.37)  | 2508 (30.80)  | 2733 (33.56)  |
| Maternal education                       |       |             |             |               |               |               |
| High school (not completed)              | 4770  | 287 (6.02)  | 237 (4.97)  | 1043 (21.87)  | 982 (20.59)   | 2221 (46.56)  |
| High school (completed)                  | 17744 | 684 (3.85)  | 948 (5.34)  | 4137 (23.31)  | 4112 (23.17)  | 7863 (44.31)  |
| College level                            | 27941 | 1169 (4.18) | 1479 (5.29) | 7956 (28.47)  | 7360 (26.34)  | 9977 (35.71)  |
| Postgraduate level                       | 16226 | 486 (3.00)  | 805 (4.96)  | 5389 (33.21)  | 4823 (29.72)  | 4723 (29.11)  |
| Maternal smoking in pregnancy (cigs/day) |       |             |             |               |               |               |
| Non smoker                               | 64265 | 2626 (4.09) | 3376 (5.25) | 18126 (28.21) | 16802 (26.14) | 23335 (36.31) |
| <2                                       | 1711  | 32 (1.87)   | 73 (4.27)   | 344 (20.11)   | 366 (21.39)   | 896 (52.37)   |

|  |       |             |             |               |               |               |
|--|-------|-------------|-------------|---------------|---------------|---------------|
| 2-4                                      | 452   | 5 (1.11)    | 11 (2.43)   | 86 (19.03)    | 99 (21.90)    | 251 (55.53)   |
| 4+                                       | 1266  | 24 (1.90)   | 54 (4.27)   | 242 (19.12)   | 276 (21.80)   | 670 (52.92)   |
| Maternal drugs use in pregnancy          |       |             |             |               |               |               |
| No                                       | 56991 | 2377 (4.17) | 3100 (5.44) | 16476 (28.91) | 14915 (26.17) | 20123 (35.31) |
| Yes                                      | 109   | 1 (0.92)    | 8 (7.34)    | 14 (12.84)    | 13 (11.93)    | 73 (66.97)    |
| Maternal age (years)                     |       |             |             |               |               |               |
| <25                                      | 3103  | 147 (4.74)  | 149 (4.80)  | 445 (14.34)   | 446 (14.37)   | 1916 (61.75)  |
| 25-29                                    | 15543 | 720 (4.63)  | 748 (4.81)  | 3221 (20.72)  | 3393 (21.83)  | 7461 (48.00)  |
| 30-34                                    | 27108 | 948 (3.50)  | 1276 (4.71) | 7636 (28.17)  | 7321 (27.01)  | 9927 (36.62)  |
| 35+                                      | 22322 | 888 (3.98)  | 1358 (6.08) | 7593 (34.02)  | 6477 (29.02)  | 6006 (26.91)  |
| Maternal height (cm)                     |       |             |             |               |               |               |
| <178                                     | 16269 | 787 (4.84)  | 928 (5.70)  | 4539 (27.90)  | 4160 (25.57)  | 5855 (35.99)  |
| 178-180                                  | 14756 | 575 (3.90)  | 771 (5.22)  | 4158 (28.18)  | 3815 (25.85)  | 5437 (36.85)  |
| 181-185                                  | 18224 | 618 (3.39)  | 957 (5.25)  | 5064 (27.79)  | 4687 (25.72)  | 6898 (37.85)  |
| 186+                                     | 17763 | 663 (3.73)  | 853 (4.80)  | 4820 (27.14)  | 4702 (26.47)  | 6725 (37.86)  |
| Maternal BMI (kg/m2)                     |       |             |             |               |               |               |
| <25                                      | 29262 | 1270 (4.34) | 1503 (5.14) | 8848 (30.24)  | 7568 (25.86)  | 10073 (34.42) |
| 25-29                                    | 30208 | 1040 (3.44) | 1538 (5.09) | 7890 (26.12)  | 8069 (26.71)  | 11671 (38.64) |
| 30-35                                    | 5819  | 246 (4.23)  | 357 (6.14)  | 1385 (23.80)  | 1333 (22.91)  | 2498 (42.93)  |
| 35+                                      | 976   | 45 (4.61)   | 89 (9.12)   | 226 (23.16)   | 203 (20.80)   | 413 (42.32)   |
| Maternal gross income                    |       |             |             |               |               |               |
| <150k                                    | 4227  | 382 (9.04)  | 269 (6.36)  | 963 (22.78)   | 807 (19.09)   | 1806 (42.73)  |
| 150-199k                                 | 2579  | 197 (7.64)  | 160 (6.20)  | 632 (24.51)   | 559 (21.68)   | 1031 (39.98)  |
| 200-299k                                 | 13446 | 683 (5.08)  | 660 (4.91)  | 3557 (26.45)  | 3097 (23.03)  | 5449 (40.53)  |
| 300-399k                                 | 21802 | 745 (3.42)  | 1233 (5.66) | 6111 (28.03)  | 5635 (25.85)  | 8078 (37.05)  |
| 400k+                                    | 23157 | 491 (2.12)  | 1126 (4.86) | 6838 (29.53)  | 6846 (29.56)  | 7856 (33.92)  |
| Maternal education                       |       |             |             |               |               |               |
| High school (not completed)              | 6745  | 348 (5.16)  | 399 (5.92)  | 1528 (22.65)  | 1434 (21.26)  | 3036 (45.01)  |
| High school (completed)                  | 25489 | 995 (3.90)  | 1339 (5.25) | 6102 (23.94)  | 5950 (23.34)  | 11103 (43.56) |
| College level                            | 18593 | 786 (4.23)  | 926 (4.98)  | 5491 (29.53)  | 5100 (27.43)  | 6290 (33.83)  |
| Postgraduate level                       | 16444 | 525 (3.19)  | 830 (5.05)  | 5570 (33.87)  | 4930 (29.98)  | 4589 (27.91)  |
| Maternal smoking in pregnancy (cigs/day) |       |             |             |               |               |               |
| Non smoker                               | 51795 | 2365 (4.57) | 2926 (5.65) | 15670 (30.25) | 13872 (26.78) | 16962 (32.75) |
| <5                                       | 7327  | 113 (1.54)  | 226 (3.08)  | 1472 (20.09)  | 1820 (24.84)  | 3696 (50.44)  |
| 5-10                                     | 1122  | 30 (2.67)   | 59 (5.26)   | 218 (19.43)   | 258 (22.99)   | 557 (49.64)   |
| 10+                                      | 6956  | 148 (2.13)  | 278 (4.00)  | 1337 (19.22)  | 1480 (21.28)  | 3713 (53.38)  |
| Maternal drugs use in pregnancy          |       |             |             |               |               |               |
| No                                       | 54621 | 2491 (4.56) | 3095 (5.67) | 16228 (29.71) | 14472 (26.50) | 18335 (33.57) |
| Yes                                      | 360   | 2 (0.56)    | 8 (2.22)    | 35 (9.72)     | 62 (17.22)    | 253 (70.28)   |

Supplementary Information, Table S9. Association between confounders and maternal alcohol in 1st trimester pregnancy (in units/occasion) – numbers (%)

|  | Total | 0             | <1            | 1-2          | 3-4         | 5+          |
|--|-------|---------------|---------------|--------------|-------------|-------------|
| Year of birth                            |       |               |               |              |             |             |
| 1999-2003                                | 12593 | 8221 (65.28)  | 2347 (18.64)  | 1312 (10.42) | 400 (3.18)  | 313 (2.49)  |
| 2004-2005                                | 20687 | 14170 (68.50) | 3518 (17.01)  | 1837 (8.88)  | 650 (3.14)  | 512 (2.47)  |
| 2006-2007                                | 23196 | 16831 (72.56) | 3426 (14.77)  | 1671 (7.20)  | 708 (3.05)  | 560 (2.41)  |
| 2008-2009                                | 11622 | 8550 (73.57)  | 1613 (13.88)  | 797 (6.86)   | 369 (3.18)  | 293 (2.52)  |
| Fetal presentation                       |       |               |               |              |             |             |
| Normal cephalic                          | 61872 | 43514 (70.33) | 9863 (15.94)  | 5098 (8.24)  | 1905 (3.08) | 1492 (2.41) |
| Breech                                   | 2503  | 1741 (69.56)  | 405 (16.18)   | 192 (7.67)   | 98 (3.92)   | 67 (2.68)   |
| Transverse                               | 152   | 105 (69.08)   | 26 (17.11)    | 16 (10.53)   | 4 (2.63)    | 1 (0.66)    |
| Anomalous cephalic                       | 3026  | 2051 (67.78)  | 518 (17.12)   | 255 (8.43)   | 96 (3.17)   | 106 (3.50)  |
| Birth weight (g)                         |       |               |               |              |             |             |
| <2500                                    | 1334  | 955 (71.59)   | 177 (13.27)   | 102 (7.65)   | 58 (4.35)   | 42 (3.15)   |
| 2500-2999                                | 5882  | 4161 (70.74)  | 916 (15.57)   | 481 (8.18)   | 180 (3.06)  | 144 (2.45)  |
| 3000-3499                                | 20035 | 14008 (69.92) | 3221 (16.08)  | 1692 (8.45)  | 636 (3.17)  | 478 (2.39)  |
| 3500-3999                                | 25758 | 18037 (70.02) | 4166 (16.17)  | 2121 (8.23)  | 779 (3.02)  | 655 (2.54)  |
| 4000+                                    | 15089 | 10611 (70.32) | 2424 (16.06)  | 1221 (8.09)  | 474 (3.14)  | 359 (2.38)  |
| Folic acid use around conception         |       |               |               |              |             |             |
| No                                       | 16126 | 11074 (68.67) | 2500 (15.50)  | 1502 (9.31)  | 545 (3.38)  | 505 (3.13)  |
| Yes                                      | 49852 | 35181 (70.57) | 8091 (16.23)  | 3951 (7.93)  | 1514 (3.04) | 1115 (2.24) |
| Planned pregnancy                        |       |               |               |              |             |             |
| No                                       | 11621 | 7381 (63.51)  | 1948 (16.76)  | 1187 (10.21) | 576 (4.96)  | 529 (4.55)  |
| Yes                                      | 55734 | 39870 (71.54) | 8848 (15.88)  | 4354 (7.81)  | 1533 (2.75) | 1129 (2.03) |
| Parity                                   |       |               |               |              |             |             |
| 0  | 32191 | 21979 (68.28) | 5096 (15.83)  | 2618 (8.13)  | 1355 (4.21) | 1143 (3.55) |
| 1+                                       | 34998 | 25156 (71.88) | 5670 (16.20)  | 2912 (8.32)  | 746 (2.13)  | 514 (1.47)  |
| Ethnic background                        |       |               |               |              |             |             |
| Norwegian                                | 56229 | 39711 (70.62) | 8765 (15.59)  | 4522 (8.04)  | 1786 (3.18) | 1445 (2.57) |
| Other                                    | 10599 | 7165 (67.60)  | 1947 (18.37)  | 1002 (9.45)  | 297 (2.80)  | 188 (1.77)  |
| Finlandian strain                        |       |               |               |              |             |             |
| Yes                                      | 39280 | 27452 (69.89) | 6484 (16.51)  | 3243 (8.26)  | 1192 (3.03) | 909 (2.31)  |
| No                                       | 27597 | 19420 (70.37) | 4230 (15.33)  | 2289 (8.29)  | 906 (3.28)  | 752 (2.72)  |
| Maternal age (years)                     |       |               |               |              |             |             |
| <25                                      | 8285  | 6576 (79.37)  | 791 (9.55)    | 321 (3.87)   | 234 (2.82)  | 363 (4.38)  |
| 25-29                                    | 24270 | 17629 (72.64) | 3406 (14.03)  | 1685 (6.94)  | 807 (3.33)  | 743 (3.06)  |
| 30-34                                    | 25626 | 17358 (67.74) | 4637 (18.09)  | 2362 (9.22)  | 804 (3.14)  | 465 (1.81)  |
| 35+                                      | 9917  | 6209 (62.61)  | 2070 (20.87)  | 1249 (12.59) | 282 (2.84)  | 107 (1.08)  |
| Maternal height (cm)                     |       |               |               |              |             |             |
| <164                                     | 14874 | 10826 (72.78) | 2123 (14.27)  | 1175 (7.90)  | 435 (2.92)  | 315 (2.12)  |
| 164-167                                  | 14526 | 10314 (71.00) | 2243 (15.44)  | 1158 (7.97)  | 455 (3.13)  | 356 (2.45)  |
| 168-171                                  | 18317 | 12645 (69.03) | 3064 (16.73)  | 1553 (8.48)  | 589 (3.22)  | 466 (2.54)  |
| 172+                                     | 19662 | 13480 (68.56) | 3369 (17.13)  | 1668 (8.48)  | 628 (3.19)  | 517 (2.63)  |
| Maternal pre-preg BMI (kg/m2)            |       |               |               |              |             |             |
| <20                                      | 8426  | 5951 (70.63)  | 1345 (15.96)  | 696 (8.26)   | 251 (2.98)  | 183 (2.17)  |
| 20-24                                    | 37171 | 25331 (68.15) | 6433 (17.31)  | 3246 (8.73)  | 1239 (3.33) | 922 (2.48)  |
| 25-29                                    | 14437 | 10424 (72.20) | 2094 (14.50)  | 1111 (7.70)  | 430 (2.98)  | 378 (2.62)  |
| 30-35                                    | 4648  | 3506 (75.43)  | 596 (12.82)   | 328 (7.06)   | 114 (2.45)  | 104 (2.24)  |
| 35+                                      | 1669  | 1308 (78.37)  | 189 (11.32)   | 92 (5.51)    | 40 (2.40)   | 40 (2.40)   |
| Maternal gross income                    |       |               |               |              |             |             |
| <150k                                    | 11218 | 8485 (75.64)  | 1407 (12.54)  | 677 (6.03)   | 306 (2.73)  | 343 (3.06)  |
| 150-199k                                 | 6782  | 5072 (74.79)  | 876 (12.92)   | 467 (6.89)   | 199 (2.93)  | 168 (2.48)  |
| 200-299k                                 | 22183 | 15902 (71.69) | 3263 (14.71)  | 1781 (8.03)  | 690 (3.11)  | 547 (2.47)  |
| 300-399k                                 | 17525 | 11742 (67.00) | 3164 (18.05)  | 1599 (9.12)  | 591 (3.37)  | 429 (2.45)  |
| 400k+                                    | 8144  | 4916 (60.36)  | 1865 (22.90)  | 922 (11.32)  | 296 (3.63)  | 145 (1.78)  |
| Maternal education                       |       |               |               |              |             |             |
| High school (not completed)              | 4770  | 3737 (78.34)  | 512 (10.73)   | 272 (5.70)   | 100 (2.10)  | 149 (3.12)  |
| High school (completed)                  | 17744 | 13245 (74.64) | 2178 (12.27)  | 1198 (6.75)  | 541 (3.05)  | 582 (3.28)  |
| College level                            | 27941 | 19481 (69.72) | 4475 (16.02)  | 2357 (8.44)  | 942 (3.37)  | 686 (2.46)  |
| Postgraduate level                       | 16226 | 10344 (63.75) | 3506 (21.61)  | 1656 (10.21) | 500 (3.08)  | 220 (1.36)  |
| Maternal smoking in pregnancy (cigs/day) |       |               |               |              |             |             |
| Non smoker                               | 64265 | 45108 (70.19) | 10398 (16.18) | 5242 (8.16)  | 1990 (3.10) | 1527 (2.38) |
| <2                                       | 1711  | 1181 (69.02)  | 243 (14.20)   | 149 (8.71)   | 64 (3.74)   | 74 (4.32)   |

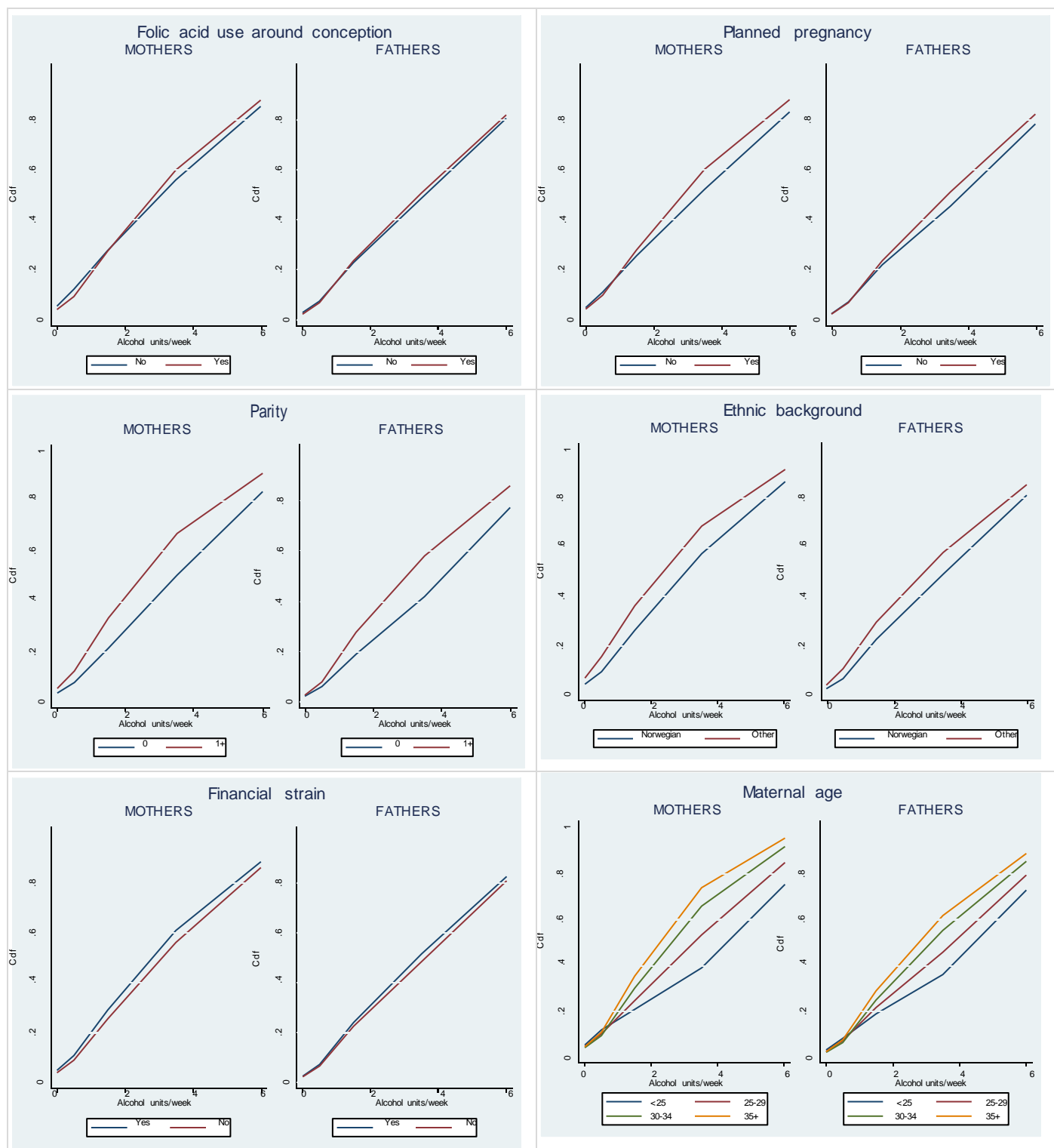
|  |       |               |              |              |             |             |
|--|-------|---------------|--------------|--------------|-------------|-------------|
| 2-4  | 452   | 334 (73.89)   | 52 (11.50)   | 42 (9.29)    | 14 (3.10)   | 10 (2.21)   |
| 4+   | 1266  | 877 (69.27)   | 151 (11.93)  | 144 (11.37)  | 41 (3.24)   | 53 (4.19)   |
| Ma te rnal drugs use in pregnancy          |       |               |              |              |             |             |
| No   | 56991 | 40968 (71.89) | 8797 (15.44) | 4451 (7.81)  | 1612 (2.83) | 1163 (2.04) |
| Ye s                                       | 109   | 37 (33.94)    | 24 (22.02)   | 21 (19.27)   | 10 (9.17)   | 17 (15.60)  |
| Pa te rnal age (years)                     |       |               |              |              |             |             |
| <25  | 3103  | 2432 (78.38)  | 297 (9.57)   | 126 (4.06)   | 95 (3.06)   | 153 (4.93)  |
| 25-29                                      | 15543 | 11553 (74.33) | 1975 (12.71) | 950 (6.11)   | 511 (3.29)  | 554 (3.56)  |
| 30-34                                      | 27108 | 19000 (70.09) | 4365 (16.10) | 2219 (8.19)  | 887 (3.27)  | 637 (2.35)  |
| 35+  | 22322 | 14772 (66.18) | 4264 (19.10) | 2321 (10.40) | 632 (2.83)  | 333 (1.49)  |
| Pa te rnal height (cm)                     |       |               |              |              |             |             |
| <178                                       | 16269 | 11730 (72.10) | 2429 (14.93) | 1209 (7.43)  | 478 (2.94)  | 423 (2.60)  |
| 178-180                                    | 14756 | 10442 (70.76) | 2315 (15.69) | 1235 (8.37)  | 436 (2.95)  | 328 (2.22)  |
| 181-185                                    | 18224 | 12715 (69.77) | 2946 (16.17) | 1518 (8.33)  | 591 (3.24)  | 454 (2.49)  |
| 186+                                       | 17763 | 12136 (68.32) | 3030 (17.06) | 1561 (8.79)  | 596 (3.36)  | 440 (2.48)  |
| Pa te rnal BMI (kg/m2)                     |       |               |              |              |             |             |
| <25  | 29262 | 20145 (68.84) | 4972 (16.99) | 2558 (8.74)  | 906 (3.10)  | 681 (2.33)  |
| 25-29                                      | 30208 | 21255 (70.36) | 4748 (15.72) | 2431 (8.05)  | 991 (3.28)  | 783 (2.59)  |
| 30-35                                      | 5819  | 4322 (74.27)  | 780 (13.40)  | 428 (7.36)   | 157 (2.70)  | 132 (2.27)  |
| 35+  | 976   | 764 (78.28)   | 105 (10.76)  | 51 (5.23)    | 27 (2.77)   | 29 (2.97)   |
| Pa te rnal gross income                    |       |               |              |              |             |             |
| <150k                                      | 4227  | 3082 (72.91)  | 550 (13.01)  | 312 (7.38)   | 140 (3.31)  | 143 (3.38)  |
| 150-199k                                   | 2579  | 1887 (73.17)  | 365 (14.15)  | 177 (6.86)   | 78 (3.02)   | 72 (2.79)   |
| 200-299k                                   | 13446 | 9809 (72.95)  | 1874 (13.94) | 992 (7.38)   | 400 (2.97)  | 371 (2.76)  |
| 300-399k                                   | 21802 | 15505 (71.12) | 3279 (15.04) | 1779 (8.16)  | 687 (3.15)  | 552 (2.53)  |
| 400k +                                     | 23157 | 15429 (66.63) | 4391 (18.96) | 2134 (9.22)  | 741 (3.20)  | 462 (2.00)  |
| Pa te rnal education                       |       |               |              |              |             |             |
| Hi gh school (not completed)               | 6745  | 5043 (74.77)  | 795 (11.79)  | 485 (7.19)   | 188 (2.79)  | 234 (3.47)  |
| Hi gh school (completed)                   | 25489 | 18718 (73.44) | 3332 (13.07) | 1845 (7.24)  | 803 (3.15)  | 791 (3.10)  |
| Co l lege level                            | 18593 | 12670 (68.14) | 3231 (17.38) | 1655 (8.90)  | 634 (3.41)  | 403 (2.17)  |
| Pos tgraduate level                        | 16444 | 10740 (65.31) | 3421 (20.80) | 1570 (9.55)  | 485 (2.95)  | 228 (1.39)  |
| Pa te rnal smoking in pregnancy (cigs/day) |       |               |              |              |             |             |
| No n s moker                               | 51795 | 36610 (70.68) | 8382 (16.18) | 4173 (8.06)  | 1523 (2.94) | 1107 (2.14) |
| <5   | 7327  | 4738 (64.66)  | 1328 (18.12) | 715 (9.76)   | 307 (4.19)  | 239 (3.26)  |
| 5-10                                       | 1122  | 779 (69.43)   | 167 (14.88)  | 97 (8.65)    | 42 (3.74)   | 37 (3.30)   |
| 10+  | 6956  | 5022 (72.20)  | 887 (12.75)  | 557 (8.01)   | 223 (3.21)  | 267 (3.84)  |
| Pa te rnal drugs use in pregnancy          |       |               |              |              |             |             |
| No   | 54621 | 39192 (71.75) | 8463 (15.49) | 4268 (7.81)  | 1516 (2.78) | 1182 (2.16) |
| Ye s                                       | 360   | 197 (54.72)   | 71 (19.72)   | 54 (15.00)   | 20 (5.56)   | 18 (5.00)   |

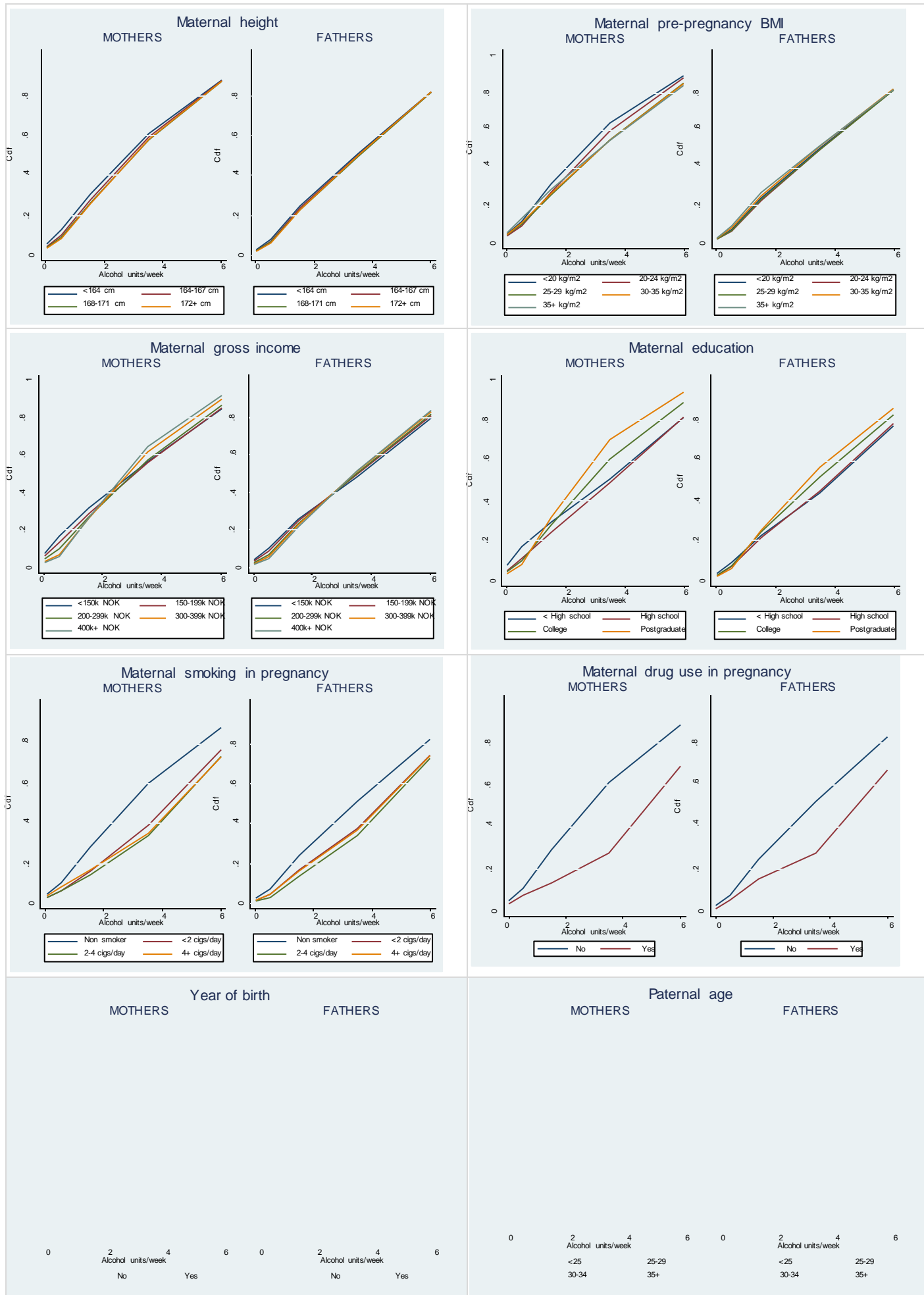
Supplementary Information, Table S10. Association between confounders and paternal alcohol in 1st trimester pregnancy (in units/occasion) – numbers (%)

|  | Total | 0           | <1           | 1-2           | 3-4           | 5+            |
|--|-------|-------------|--------------|---------------|---------------|---------------|
| Year of birth                            |       |             |              |               |               |               |
| 1999-2003                                | 12593 | 598 (4.75)  | 153 (1.21)   | 3617 (28.72)  | 3497 (27.77)  | 4728 (37.54)  |
| 2004-2005                                | 20687 | 918 (4.44)  | 237 (1.15)   | 6356 (30.72)  | 5569 (26.92)  | 7607 (36.77)  |
| 2006-2007                                | 23196 | 1146 (4.94) | 2659 (11.46) | 7132 (30.75)  | 5513 (23.77)  | 6746 (29.08)  |
| 2008-2009                                | 11622 | 568 (4.89)  | 1593 (13.71) | 3650 (31.41)  | 2701 (23.24)  | 3110 (26.76)  |
| Fetal presentation                       |       |             |              |               |               |               |
| Normal cephalic                          | 61872 | 2959 (4.78) | 4246 (6.86)  | 18959 (30.64) | 15661 (25.31) | 20047 (32.40) |
| Breech                                   | 2503  | 94 (3.76)   | 184 (7.35)   | 706 (28.21)   | 658 (26.29)   | 861 (34.40)   |
| Transverse                               | 152   | 8 (5.26)    | 12 (7.89)    | 50 (32.89)    | 42 (27.63)    | 40 (26.32)    |
| Anomalous cephalic                       | 3026  | 146 (4.82)  | 175 (5.78)   | 854 (28.22)   | 789 (26.07)   | 1062 (35.10)  |
| Birth weight (g)                         |       |             |              |               |               |               |
| <2500                                    | 1334  | 64 (4.80)   | 92 (6.90)    | 359 (26.91)   | 310 (23.24)   | 509 (38.16)   |
| 2500-2999                                | 5882  | 296 (5.03)  | 407 (6.92)   | 1733 (29.46)  | 1429 (24.29)  | 2017 (34.29)  |
| 3000-3499                                | 20035 | 954 (4.76)  | 1369 (6.83)  | 6074 (30.32)  | 5087 (25.39)  | 6551 (32.70)  |
| 3500-3999                                | 25758 | 1188 (4.61) | 1780 (6.91)  | 7836 (30.42)  | 6563 (25.48)  | 8391 (32.58)  |
| 4000+                                    | 15089 | 728 (4.82)  | 994 (6.59)   | 4753 (31.50)  | 3891 (25.79)  | 4723 (31.30)  |
| Folic acid use around conception         |       |             |              |               |               |               |
| No                                       | 16126 | 908 (5.63)  | 852 (5.28)   | 4548 (28.20)  | 4004 (24.83)  | 5814 (36.05)  |
| Yes                                      | 49852 | 2189 (4.39) | 3666 (7.35)  | 15591 (31.27) | 12738 (25.55) | 15668 (31.43) |
| Planned pregnancy                        |       |             |              |               |               |               |
| Yes                                      | 11621 | 588 (5.06)  | 827 (7.12)   | 3160 (27.19)  | 2627 (22.61)  | 4419 (38.03)  |
| No                                       | 55734 | 2578 (4.63) | 3772 (6.77)  | 17382 (31.19) | 14467 (25.96) | 17535 (31.46) |
| Parity                                   |       |             |              |               |               |               |
| 0  | 32191 | 1437 (4.46) | 1870 (5.81)  | 8145 (25.30)  | 7969 (24.76)  | 12770 (39.67) |
| 1+                                       | 34998 | 1732 (4.95) | 2712 (7.75)  | 12379 (35.37) | 9081 (25.95)  | 9094 (25.98)  |
| Ethnic background                        |       |             |              |               |               |               |
| Norwegian                                | 56229 | 2348 (4.18) | 3645 (6.48)  | 16824 (29.92) | 14367 (25.55) | 19045 (33.87) |
| Other                                    | 10599 | 824 (7.77)  | 921 (8.69)   | 3564 (33.63)  | 2588 (24.42)  | 2702 (25.49)  |
| Finlandian strain                        |       |             |              |               |               |               |
| Yes                                      | 39280 | 1947 (4.96) | 2655 (6.76)  | 12300 (31.31) | 10143 (25.82) | 12235 (31.15) |
| No                                       | 27597 | 1180 (4.28) | 1907 (6.91)  | 8093 (29.33)  | 6856 (24.84)  | 9561 (34.65)  |
| Maternal age (years)                     |       |             |              |               |               |               |
| <25                                      | 8285  | 592 (7.15)  | 556 (6.71)   | 1545 (18.65)  | 1524 (18.39)  | 4068 (49.10)  |
| 25-29                                    | 24270 | 1193 (4.92) | 1517 (6.25)  | 6491 (26.74)  | 5843 (24.07)  | 9226 (38.01)  |
| 30-34                                    | 25626 | 978 (3.82)  | 1739 (6.79)  | 8858 (34.57)  | 7161 (27.94)  | 6890 (26.89)  |
| 35+                                      | 9917  | 467 (4.71)  | 830 (8.37)   | 3861 (38.93)  | 2752 (27.75)  | 2007 (20.24)  |
| Maternal height (cm)                     |       |             |              |               |               |               |
| <164                                     | 14874 | 864 (5.81)  | 1075 (7.23)  | 4502 (30.27)  | 3599 (24.20)  | 4834 (32.50)  |
| 164-167                                  | 14526 | 677 (4.66)  | 1064 (7.32)  | 4412 (30.37)  | 3607 (24.83)  | 4766 (32.81)  |
| 168-171                                  | 18317 | 840 (4.59)  | 1178 (6.43)  | 5509 (30.08)  | 4751 (25.94)  | 6039 (32.97)  |
| 172+                                     | 19662 | 798 (4.06)  | 1288 (6.55)  | 6123 (31.14)  | 5136 (26.12)  | 6317 (32.13)  |
| Maternal pre-preg BMI (kg/m2)            |       |             |              |               |               |               |
| <20                                      | 8426  | 443 (5.26)  | 612 (7.26)   | 2579 (30.61)  | 2073 (24.60)  | 2719 (32.27)  |
| 20-24                                    | 37171 | 1652 (4.44) | 2367 (6.37)  | 11480 (30.88) | 9596 (25.82)  | 12076 (32.49) |
| 25-29                                    | 14437 | 654 (4.53)  | 1019 (7.06)  | 4329 (29.99)  | 3670 (25.42)  | 4765 (33.01)  |
| 30-35                                    | 4648  | 262 (5.64)  | 375 (8.07)   | 1371 (29.50)  | 1141 (24.55)  | 1499 (32.25)  |
| 35+                                      | 1669  | 100 (5.99)  | 167 (10.01)  | 478 (28.64)   | 364 (21.81)   | 560 (33.55)   |
| Maternal gross income                    |       |             |              |               |               |               |
| <150k                                    | 11218 | 939 (8.37)  | 801 (7.14)   | 3007 (26.81)  | 2317 (20.65)  | 4154 (37.03)  |
| 150-199k                                 | 6782  | 425 (6.27)  | 468 (6.90)   | 1911 (28.18)  | 1559 (22.99)  | 2419 (35.67)  |
| 200-299k                                 | 22183 | 984 (4.44)  | 1342 (6.05)  | 6672 (30.08)  | 5616 (25.32)  | 7569 (34.12)  |
| 300-399k                                 | 17525 | 504 (2.88)  | 1318 (7.52)  | 5660 (32.30)  | 4837 (27.60)  | 5206 (29.71)  |
| 400k+                                    | 8144  | 190 (2.33)  | 556 (6.83)   | 2823 (34.66)  | 2433 (29.87)  | 2142 (26.30)  |
| Maternal education                       |       |             |              |               |               |               |
| High school (not completed)              | 4770  | 369 (7.74)  | 321 (6.73)   | 1122 (23.52)  | 990 (20.75)   | 1968 (41.26)  |
| High school (completed)                  | 17744 | 865 (4.87)  | 1227 (6.92)  | 4522 (25.48)  | 4045 (22.80)  | 7085 (39.93)  |
| College level                            | 27941 | 1333 (4.77) | 1888 (6.76)  | 8700 (31.14)  | 7219 (25.84)  | 8801 (31.50)  |
| Postgraduate level                       | 16226 | 573 (3.53)  | 1117 (6.88)  | 6015 (37.07)  | 4666 (28.76)  | 3855 (23.76)  |
| Maternal smoking in pregnancy (cigs/day) |       |             |              |               |               |               |
| Non smoker                               | 64265 | 3107 (4.83) | 4427 (6.89)  | 19916 (30.99) | 16396 (25.51) | 20419 (31.77) |
| <2                                       | 1711  | 50 (2.92)   | 105 (6.14)   | 363 (21.22)   | 380 (22.21)   | 813 (47.52)   |

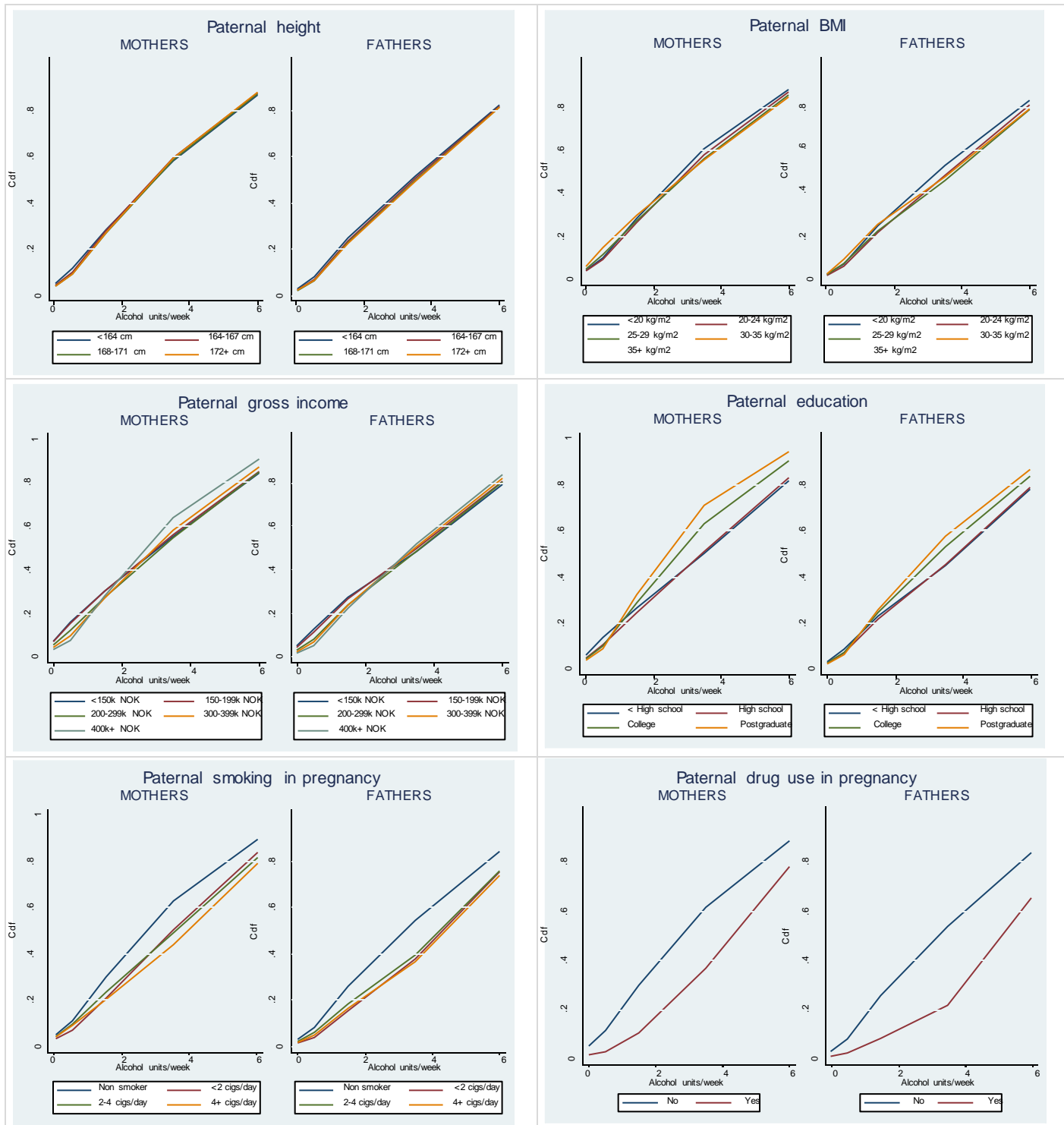
|  |       |             |             |               |               |               |
|--|-------|-------------|-------------|---------------|---------------|---------------|
| 2-4  | 452   | 10 (2.21)   | 14 (3.10)   | 98 (21.68)    | 106 (23.45)   | 224 (49.56)   |
| 4+   | 1266  | 45 (3.55)   | 72 (5.69)   | 266 (21.01)   | 289 (22.83)   | 594 (46.92)   |
| Ma te rnal drugs use in pregnancy          |       |             |             |               |               |               |
| No   | 56991 | 2805 (4.92) | 3987 (7.00) | 17894 (31.40) | 14483 (25.41) | 17822 (31.27) |
| Yes  | 109   | 5 (4.59)    | 8 (7.34)    | 18 (16.51)    | 18 (16.51)    | 60 (55.05)    |
| Pa te rnal age (years)                     |       |             |             |               |               |               |
| <25  | 3103  | 223 (7.19)  | 203 (6.54)  | 520 (16.76)   | 488 (15.73)   | 1669 (53.79)  |
| 25-29                                      | 15543 | 863 (5.55)  | 967 (6.22)  | 3661 (23.55)  | 3409 (21.93)  | 6643 (42.74)  |
| 30-34                                      | 27108 | 1100 (4.06) | 1685 (6.22) | 8383 (30.92)  | 7204 (26.58)  | 8736 (32.23)  |
| 35+  | 22322 | 1043 (4.67) | 1782 (7.98) | 8186 (36.67)  | 6173 (27.65)  | 5138 (23.02)  |
| Pa te rnal height (cm)                     |       |             |             |               |               |               |
| <178                                       | 16269 | 943 (5.80)  | 1196 (7.35) | 4929 (30.30)  | 4088 (25.13)  | 5113 (31.43)  |
| 178-180                                    | 14756 | 696 (4.72)  | 1010 (6.84) | 4556 (30.88)  | 3695 (25.04)  | 4799 (32.52)  |
| 181-185                                    | 18224 | 742 (4.07)  | 1287 (7.06) | 5585 (30.65)  | 4594 (25.21)  | 6016 (33.01)  |
| 186+                                       | 17763 | 782 (4.40)  | 1128 (6.35) | 5359 (30.17)  | 4621 (26.01)  | 5873 (33.06)  |
| Pa te rnal BMI (kg/m2)                     |       |             |             |               |               |               |
| <25  | 29262 | 1518 (5.19) | 1973 (6.74) | 9677 (33.07)  | 7386 (25.24)  | 8708 (29.76)  |
| 25-29                                      | 30208 | 1251 (4.14) | 2035 (6.74) | 8750 (28.97)  | 7904 (26.17)  | 10268 (33.99) |
| 30-35                                      | 5819  | 294 (5.05)  | 480 (8.25)  | 1522 (26.16)  | 1315 (22.60)  | 2208 (37.94)  |
| 35+  | 976   | 54 (5.53)   | 109 (11.17) | 246 (25.20)   | 202 (20.70)   | 365 (37.40)   |
| Pa te rnal gross income                    |       |             |             |               |               |               |
| <150k                                      | 4227  | 464 (10.98) | 327 (7.74)  | 1056 (24.98)  | 813 (19.23)   | 1567 (37.07)  |
| 150-199K                                   | 2579  | 233 (9.03)  | 204 (7.91)  | 674 (26.13)   | 540 (20.94)   | 928 (35.98)   |
| 200-299k                                   | 13446 | 810 (6.02)  | 810 (6.02)  | 3765 (28.00)  | 3092 (23.00)  | 4969 (36.96)  |
| 300-399k                                   | 21802 | 897 (4.11)  | 1616 (7.41) | 6704 (30.75)  | 5485 (25.16)  | 7100 (32.57)  |
| 400k +                                     | 23157 | 597 (2.58)  | 1594 (6.88) | 7734 (33.40)  | 6664 (28.78)  | 6568 (28.36)  |
| Pa te rnal education                       |       |             |             |               |               |               |
| Hi gh school (not completed)               | 6745  | 443 (6.57)  | 509 (7.55)  | 1631 (24.18)  | 1423 (21.10)  | 2739 (40.61)  |
| Hi gh school (completed)                   | 25489 | 1228 (4.82) | 1728 (6.78) | 6669 (26.16)  | 5922 (23.23)  | 9942 (39.01)  |
| Co l lege level                            | 18593 | 898 (4.83)  | 1206 (6.49) | 6008 (32.31)  | 4980 (26.78)  | 5501 (29.59)  |
| Pos tgraduate level                        | 16444 | 598 (3.64)  | 1155 (7.02) | 6225 (37.86)  | 4725 (28.73)  | 3741 (22.75)  |
| Pa te rnal smoking in pregnancy (cigs/day) |       |             |             |               |               |               |
| No n s moker                               | 51795 | 2781 (5.37) | 3842 (7.42) | 17182 (33.17) | 13378 (25.83) | 14612 (28.21) |
| <5   | 7327  | 142 (1.94)  | 305 (4.16)  | 1697 (23.16)  | 1900 (25.93)  | 3283 (44.81)  |
| 5-10                                       | 1122  | 38 (3.39)   | 76 (6.77)   | 237 (21.12)   | 261 (23.26)   | 510 (45.45)   |
| 10+  | 6956  | 214 (3.08)  | 370 (5.32)  | 1428 (20.53)  | 1529 (21.98)  | 3415 (49.09)  |
| Pa te rnal drugs use in pregnancy          |       |             |             |               |               |               |
| No   | 54621 | 2922 (5.35) | 3974 (7.28) | 17552 (32.13) | 13939 (25.52) | 16234 (29.72) |
| Yes  | 360   | 3 (0.83)    | 11 (3.06)   | 46 (12.78)    | 70 (19.44)    | 230 (63.89)   |

Supplementary Information, Figure S1 Distribution of confounders by parental alcohol use BEFORE the pregnancy - cumulative distribution functions. X-axis represents median of category

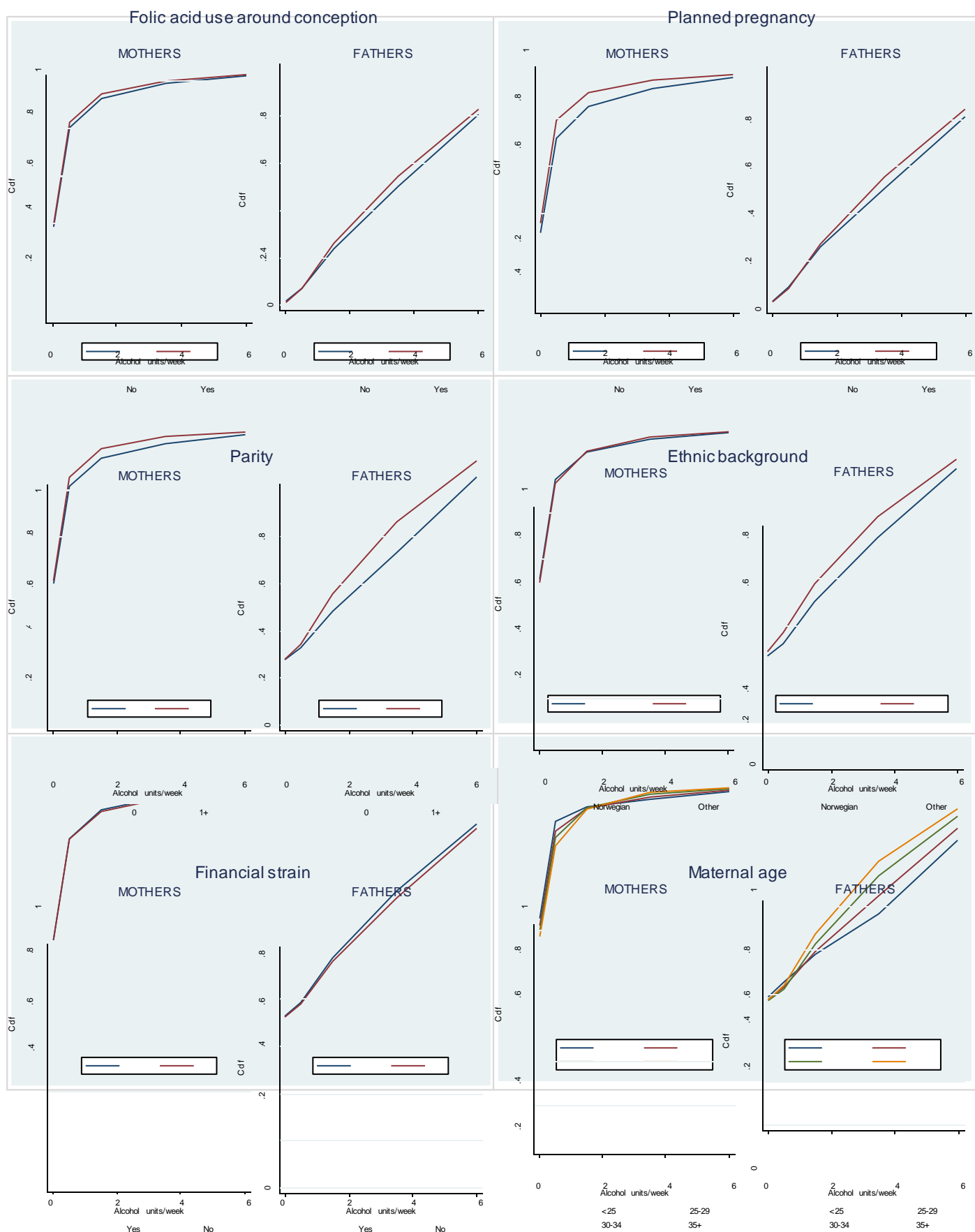


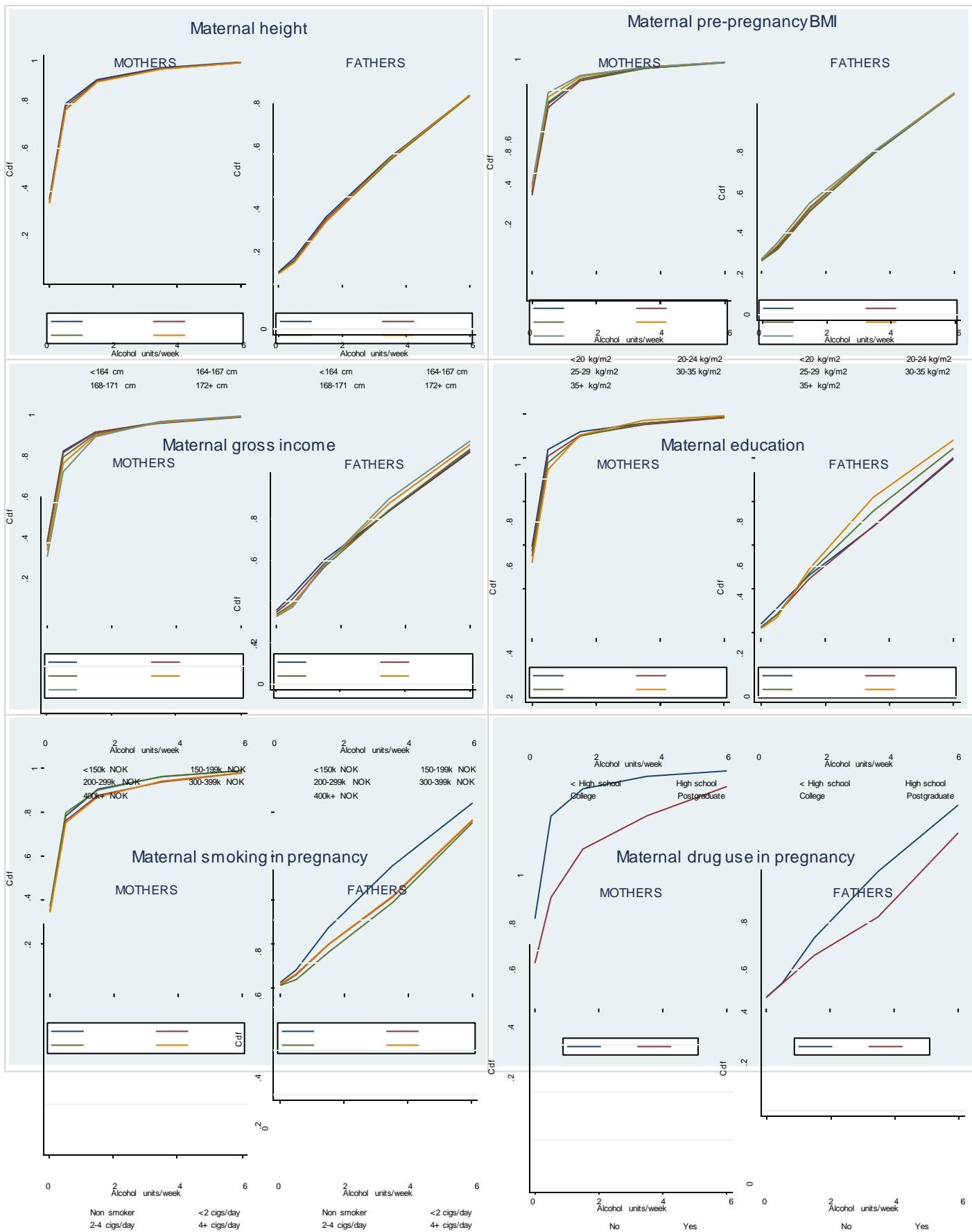


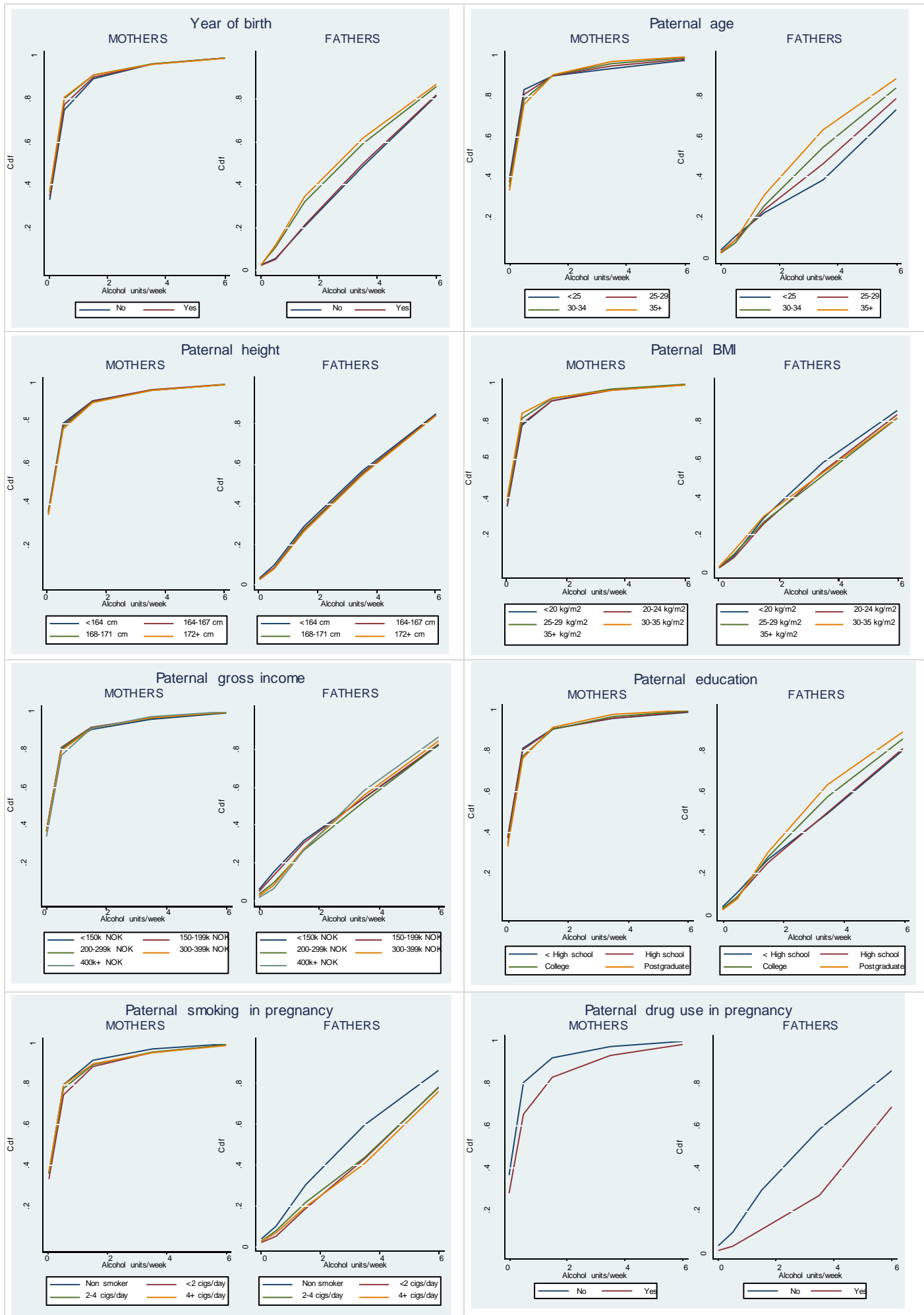




Supplementary Information, Figure S2 Distribution of confounders by parental alcohol use DURING the pregnancy - cumulative distribution functions. X-axis represents median of category







## Confounders-outcomes associations

Supplementary Information, Table S11. Association between confounders and head circumference at birth - betas are expressed in units of sex-standardised head circumference (differences in standard deviations compared to the reference category).

|  | beta  | 95% CI       | p value |
|--|-------|--------------|---------|
| Birth weight (100g)                      | 0.11  | 0.11, 0.11   | <0.001  |
| Year of birth (2years)                   | -0.03 | -0.04, -0.02 | <0.001  |
|  |       |              |         |
| Maternal age (5years)                    | 0.04  | 0.03, 0.05   | <0.001  |
| Maternal height (5cm)                    | 0.09  | 0.09, 0.10   | <0.001  |
| Maternal pre-preg weight (5kg)           | 0.06  | 0.06, 0.06   | <0.001  |
| Maternal smoking (2cigs/day)             | -0.04 | -0.05, -0.04 | <0.001  |
|  |       |              |         |
| Paternal age (5years)                    | 0.03  | 0.02, 0.03   | <0.001  |
| Paternal height (5cm)                    | 0.05  | 0.05, 0.06   | <0.001  |
| Paternal pre-preg weight (5kg)           | 0.03  | 0.03, 0.03   | <0.001  |
| Paternal smoking (2cigs/day)             | -0.01 | -0.01, -0.00 | <0.001  |
|  |       |              |         |
| Fetal presentation (ref Normal cephalic) |       |              |         |
| Breech                                   | 0.18  | 0.15, 0.21   | <0.001  |
| Transverse                               | 0.04  | -0.10, 0.17  | 0.588   |
| Anomaly cephalic                         | -0.07 | -0.10, -0.03 | <0.001  |
| Folic acid use                           | -0.01 | -0.03, 0.00  | 0.073   |
| Planned pregnancy (yes Vs no)            | 0.03  | 0.01, 0.05   | 0.001   |
| Parity (1+ vs no previous pregnancies)   | 0.21  | 0.20, 0.22   | <0.001  |
| Financial strain (yes vs no)             | 0.01  | -0.01, 0.02  | 0.385   |
| Ethnic background (other vs Norwegian)   | -0.14 | -0.15, -0.12 | <0.001  |
|  |       |              |         |
| Maternal gross income (ref 200-299k)     | beta  | CI           | p value |
| <150k                                    | -0.02 | -0.04, -0.01 | 0.011   |
| 150-199K                                 | 0.02  | 0.00, 0.05   | 0.022   |
| 300-399k                                 | -0.01 | -0.03, 0.00  | 0.136   |
| 400k+                                    | -0.02 | -0.04, -0.00 | 0.029   |
| Maternal education (ref College level)   |       |              |         |
| High school (not completed)              | -0.05 | -0.08, -0.03 | <0.001  |
| High school (completed)                  | 0.01  | -0.00, 0.03  | 0.090   |
| Postgraduate level                       | -0.01 | -0.03, 0.00  | 0.052   |
| Maternal smoking in preg (yes vs no)     | -0.12 | -0.14, -0.09 | <0.001  |
| Maternal drugs use (yes vs no)           | -0.25 | -0.41, -0.09 | 0.002   |
|  |       |              |         |
| Paternal gross income (ref 200-299k)     |       |              |         |
| <150k                                    | -0.06 | -0.09, -0.03 | <0.001  |
| 150-199K                                 | -0.03 | -0.07, -0.00 | 0.049   |
| 300-399k                                 | 0.03  | 0.01, 0.04   | <0.001  |
| 400k+                                    | -0.01 | -0.03, -0.00 | 0.034   |
| Paternal education (ref College level)   |       |              |         |
| High school (not completed)              | -0.01 | -0.03, 0.01  | 0.359   |
| High school (completed)                  | 0.01  | -0.00, 0.02  | 0.080   |
| Postgraduate level                       | -0.02 | -0.04, -0.01 | 0.007   |
| Paternal smoking in preg (yes vs no)     | -0.03 | -0.04, -0.01 | 0.001   |
| Paternal drugs use (yes vs no)           | -0.16 | -0.24, -0.07 | <0.001  |
|  |       |              |         |

**Supplementary Information, Table S12. Association between confounders and head circumference at 3 months - betas are expressed in units of head circumference standardised for sex and age at clinic visit (differences in standard deviations compared to the reference category) ..**

|  | beta  | 95% CI       | p value |
|--|-------|--------------|---------|
| Birth weight (100g)                      | 0.09  | 0.09, 0.09   | <0.001  |
| Year of birth (2years)                   | -0.01 | -0.02, -0.00 | 0.044   |
|  |       |              |         |
| Maternal age (5years)                    | 0.03  | 0.02, 0.04   | <0.001  |
| Maternal height (5cm)                    | 0.10  | 0.09, 0.11   | <0.001  |
| Maternal pre-preg weight (5kg)           | 0.05  | 0.04, 0.05   | <0.001  |
| Maternal smoking (2cigs/day)             | -0.04 | -0.05, -0.03 | <0.001  |
|  |       |              |         |
| Paternal age (5years)                    | 0.02  | 0.01, 0.03   | <0.001  |
| Paternal height (5cm)                    | 0.08  | 0.07, 0.08   | <0.001  |
| Paternal pre-preg weight (5kg)           | 0.04  | 0.03, 0.04   | <0.001  |
| Paternal smoking (2cigs/day)             | -0.01 | -0.01, -0.01 | <0.001  |
|  |       |              |         |
| Fetal presentation (ref Normal cephalic) |       |              |         |
| Breech                                   | -0.04 | -0.08, 0.01  | 0.085   |
| Transverse                               | -0.08 | -0.25, 0.09  | 0.355   |
| Anomaly cephalic                         | 0.11  | 0.07, 0.15   | <0.001  |
| Folic acid use                           | 0.02  | -0.00, 0.04  | 0.119   |
| Planned pregnancy (yes Vs no)            | 0.03  | 0.00, 0.05   | 0.026   |
| Parity (1+ vs no previous pregnancies)   | 0.12  | 0.10, 0.14   | <0.001  |
| Financial strain (yes vs no)             | -0.00 | -0.02, 0.01  | 0.799   |
| Ethnic background (other vs Norwegian)   | -0.10 | -0.13, -0.08 | <0.001  |
|  |       |              |         |
| Maternal gross income (ref 200-299k)     |       |              |         |
| <150k                                    | -0.02 | -0.05, -0.00 | 0.040   |
| 150-199K                                 | -0.02 | -0.05, 0.01  | 0.187   |
| 300-399k                                 | 0.02  | -0.00, 0.04  | 0.069   |
| 400k+                                    | 0.05  | 0.02, 0.07   | <0.001  |
| Maternal education (ref College level)   |       |              |         |
| High school (not completed)              | -0.11 | -0.14, -0.07 | <0.001  |
| High school (completed)                  | -0.05 | -0.07, -0.03 | <0.001  |
| Postgraduate level                       | 0.06  | 0.04, 0.08   | <0.001  |
| Maternal smoking in preg (yes vs no)     | -0.10 | -0.13, -0.07 | <0.001  |
| Maternal drugs use (yes vs no)           | -0.31 | -0.52, -0.10 | 0.004   |
|  |       |              |         |
| Paternal gross income (ref 200-299k)     |       |              |         |
| <150k                                    | -0.01 | -0.05, 0.02  | 0.432   |
| 150-199K                                 | -0.03 | -0.07, 0.01  | 0.192   |
| 300-399k                                 | 0.01  | -0.01, 0.03  | 0.170   |
| 400k+                                    | 0.01  | -0.01, 0.02  | 0.469   |
| Paternal education (ref College level)   |       |              |         |
| High school (not completed)              | -0.06 | -0.09, -0.03 | <0.001  |
| High school (completed)                  | -0.04 | -0.05, -0.02 | <0.001  |
| Postgraduate level                       | 0.06  | 0.04, 0.08   | <0.001  |
| Paternal smoking in preg (yes vs no)     | -0.05 | -0.07, -0.03 | <0.001  |
| Paternal drugs use (yes vs no)           | -0.10 | -0.21, 0.02  | 0.099   |
|  |       |              |         |

## Sensitivity analyses

Supplementary Information, Table S13. Maternal and Paternal Average Alcohol Units per Week and Head Circumference at Birth – Differences in SD Scores (Beta) and 95% Confidence Intervals (CI), MoBa data, Norway, 1999-2009.

Before pregnancy

|                                   | Mother |              |       |  | Father |              |       |
|-----------------------------------|--------|--------------|-------|--|--------|--------------|-------|
|                                   | Beta   | 95% CI       | P     |  | Beta   | 95% CI       | P     |
| Crude model                       |        |              |       |  |        |              |       |
| Non drinker                       | Ref    |              |       |  | Ref    |              |       |
| <1 unit                           | 0.02   | -0.01, 0.05  | 0.248 |  | 0.01   | -0.03, 0.05  | 0.632 |
| 1-2 units                         | -0.01  | -0.04, 0.02  | 0.453 |  | 0.02   | -0.02, 0.06  | 0.350 |
| 3-4 units                         | -0.02  | -0.05, 0.02  | 0.352 |  | -0.02  | -0.06, 0.03  | 0.456 |
| 5+ units                          | -0.06  | -0.09, -0.02 | 0.002 |  | -0.05  | -0.10, -0.01 | 0.011 |
| Mutually adjusted model           |        |              |       |  |        |              |       |
| Non drinker                       | Ref    |              |       |  | Ref    |              |       |
| <1 unit                           | 0.02   | -0.02, 0.05  | 0.356 |  | 0.01   | -0.04, 0.05  | 0.738 |
| 1-2 units                         | -0.01  | -0.04, 0.03  | 0.672 |  | 0.02   | -0.02, 0.07  | 0.327 |
| 3-4 units                         | -0.00  | -0.04, 0.04  | 0.969 |  | -0.01  | -0.06, 0.04  | 0.702 |
| 5+ units                          | -0.03  | -0.07, 0.01  | 0.128 |  | -0.04  | -0.09, 0.01  | 0.108 |
| Fully and mutually adjusted model |        |              |       |  |        |              |       |
| Non drinker                       | Ref    |              |       |  | Ref    |              |       |
| <1 unit                           | 0.00   | -0.03, 0.04  | 0.790 |  | -0.01  | -0.06, 0.03  | 0.599 |
| 1-2 units                         | 0.01   | -0.03, 0.04  | 0.755 |  | 0.01   | -0.04, 0.05  | 0.684 |
| 3-4 units                         | 0.01   | -0.03, 0.05  | 0.542 |  | -0.00  | -0.05, 0.04  | 0.899 |
| 5+ units                          | 0.01   | -0.03, 0.05  | 0.495 |  | -0.01  | -0.06, 0.03  | 0.594 |

Test for trend maternal and paternal alcohol intake in full model: p=0.369 and p=0.425

In the first trimester of gestation

|                                   | Mother |              |       |  | Father |             |       |
|-----------------------------------|--------|--------------|-------|--|--------|-------------|-------|
|                                   | Beta   | 95% CI       | P     |  | Beta   | 95% CI      | P     |
| Crude model                       |        |              |       |  |        |             |       |
| Non drinker                       | Ref    |              |       |  | Ref    |             |       |
| <1 unit                           | -0.00  | -0.02, 0.02  | 0.863 |  | 0.01   | -0.02, 0.05 | 0.468 |
| 1-2 units                         | -0.04  | -0.09, 0.02  | 0.202 |  | 0.03   | -0.01, 0.06 | 0.187 |
| 3-4 units                         | -0.11  | -0.20, -0.01 | 0.030 |  | -0.00  | -0.04, 0.04 | 0.846 |
| 5+ units                          | -0.06  | -0.18, 0.05  | 0.299 |  | -0.03  | -0.07, 0.01 | 0.190 |
| Mutually adjusted model           |        |              |       |  |        |             |       |
| Non drinker                       | Ref    |              |       |  | Ref    |             |       |
| <1 unit                           | 0.00   | -0.02, 0.02  | 0.783 |  | 0.02   | -0.02, 0.05 | 0.424 |
| 1-2 units                         | -0.03  | -0.09, 0.02  | 0.244 |  | 0.03   | -0.01, 0.07 | 0.178 |
| 3-4 units                         | -0.10  | -0.19, -0.00 | 0.049 |  | -0.00  | -0.04, 0.04 | 0.976 |
| 5+ units                          | -0.04  | -0.16, 0.07  | 0.468 |  | -0.02  | -0.06, 0.02 | 0.280 |
| Fully and mutually adjusted model |        |              |       |  |        |             |       |
| Non drinker                       | Ref    |              |       |  | Ref    |             |       |
| <1 unit                           | 0.00   | -0.02, 0.02  | 0.847 |  | -0.00  | -0.04, 0.03 | 0.881 |
| 1-2 units                         | -0.00  | -0.06, 0.05  | 0.906 |  | 0.02   | -0.02, 0.06 | 0.367 |
| 3-4 units                         | -0.05  | -0.14, 0.05  | 0.337 |  | 0.01   | -0.03, 0.05 | 0.768 |
| 5+ units                          | 0.02   | -0.09, 0.13  | 0.753 |  | 0.00   | -0.04, 0.04 | 0.976 |

Test for trend maternal and paternal alcohol intake in full model: p=0.977 and p=0.879

Supplementary Information, Table S14. Maternal and Paternal Average Alcohol Units per Week and Head Circumference at 3 Months Post-Partum – Differences in SD Scores (Beta) and 95% Confidence Intervals (CI), MoBa data, Norway, 1999-2009.

Before pregnancy

|                                   | Mother |             |       |  | Father |              |       |
|-----------------------------------|--------|-------------|-------|--|--------|--------------|-------|
|                                   | Beta   | 95% CI      | P     |  | Beta   | 95% CI       | P     |
| Crude model                       |        |             |       |  |        |              |       |
| Non drinker                       | Ref    |             |       |  | Ref    |              |       |
| <1 unit                           | -0.00  | -0.04, 0.04 | 0.947 |  | -0.04  | -0.09, 0.01  | 0.144 |
| 1-2 units                         | -0.00  | -0.04, 0.04 | 0.831 |  | -0.02  | -0.08, 0.03  | 0.393 |
| 3-4 units                         | 0.02   | -0.02, 0.06 | 0.386 |  | -0.04  | -0.10, 0.01  | 0.140 |
| 5+ units                          | -0.01  | -0.05, 0.04 | 0.820 |  | -0.04  | -0.10, 0.01  | 0.121 |
| Mutually adjusted model           |        |             |       |  |        |              |       |
| Non drinker                       | Ref    |             |       |  | Ref    |              |       |
| <1 unit                           | 0.02   | -0.02, 0.06 | 0.361 |  | -0.06  | -0.12, 0.00  | 0.063 |
| 1-2 units                         | 0.02   | -0.03, 0.07 | 0.402 |  | -0.04  | -0.10, 0.02  | 0.182 |
| 3-4 units                         | 0.05   | -0.00, 0.10 | 0.072 |  | -0.07  | -0.13, -0.00 | 0.043 |
| 5+ units                          | 0.03   | -0.03, 0.08 | 0.359 |  | -0.07  | -0.13, -0.00 | 0.037 |
| Fully and mutually adjusted model |        |             |       |  |        |              |       |
| Non drinker                       | Ref    |             |       |  | Ref    | Ref          |       |
| <1 unit                           | 0.01   | -0.04, 0.05 | 0.719 |  | -0.05  | -0.11, 0.01  | 0.082 |
| 1-2 units                         | 0.02   | -0.03, 0.06 | 0.491 |  | -0.04  | -0.10, 0.02  | 0.245 |
| 3-4 units                         | 0.03   | -0.02, 0.08 | 0.243 |  | -0.05  | -0.11, 0.02  | 0.149 |
| 5+ units                          | 0.04   | -0.02, 0.09 | 0.181 |  | -0.04  | -0.11, 0.02  | 0.187 |

Test for trend maternal and paternal alcohol intake in full model: p=0.110 and p=0.903

In the first trimester of gestation

|                                   | Mother |             |       |  | Father |              |       |
|-----------------------------------|--------|-------------|-------|--|--------|--------------|-------|
|                                   | Beta   | 95% CI      | P     |  | Beta   | 95% CI       | P     |
| Crude model                       |        |             |       |  |        |              |       |
| Non drinker                       | Ref    |             |       |  | Ref    |              |       |
| <1 unit                           | 0.02   | -0.00, 0.04 | 0.114 |  | -0.05  | -0.10, 0.00  | 0.074 |
| 1-2 units                         | -0.02  | -0.09, 0.05 | 0.632 |  | -0.02  | -0.07, 0.03  | 0.392 |
| 3-4 units                         | 0.03   | -0.09, 0.16 | 0.583 |  | -0.02  | -0.08, 0.03  | 0.369 |
| 5+ units                          | -0.13  | -0.28, 0.02 | 0.088 |  | -0.05  | -0.11, 0.00  | 0.054 |
| Mutually adjusted model           |        |             |       |  |        |              |       |
| Non drinker                       | Ref    |             |       |  | Ref    |              |       |
| <1 unit                           | 0.02   | -0.00, 0.05 | 0.077 |  | -0.05  | -0.10, 0.00  | 0.061 |
| 1-2 units                         | -0.02  | -0.09, 0.05 | 0.627 |  | -0.02  | -0.08, 0.03  | 0.358 |
| 3-4 units                         | 0.03   | -0.09, 0.16 | 0.581 |  | -0.03  | -0.08, 0.03  | 0.313 |
| 5+ units                          | -0.12  | -0.27, 0.03 | 0.124 |  | -0.06  | -0.11, -0.00 | 0.045 |
| Fully and mutually adjusted model |        |             |       |  |        |              |       |
| Non drinker                       | Ref    |             |       |  | Ref    |              |       |
| <1 unit                           | 0.02   | -0.01, 0.04 | 0.183 |  | -0.05  | -0.10, -0.00 | 0.044 |
| 1-2 units                         | 0.00   | -0.07, 0.07 | 0.927 |  | -0.03  | -0.08, 0.03  | 0.324 |
| 3-4 units                         | 0.06   | -0.06, 0.18 | 0.320 |  | -0.02  | -0.07, 0.03  | 0.496 |
| 5+ units                          | -0.08  | -0.23, 0.07 | 0.280 |  | -0.04  | -0.10, 0.01  | 0.105 |

Test for trend maternal and paternal alcohol intake in full model: p=0.842 and p=0.995



Supplementary Information, Table S15. Maternal and Paternal Average Alcohol Units per Week and Microcephaly at Birth – Odds Ratio (OR) and 95% Confidence Intervals (CI), MoBa data, Norway, 1999-2009.

Before pregnancy

|                                   | Mother |            |       | Father |            |       |
|-----------------------------------|--------|------------|-------|--------|------------|-------|
|                                   | OR     | 95% CI     | P     | OR     | 95% CI     | P     |
| Crude model                       |        |            |       |        |            |       |
| Non drinker                       | Ref    |            |       | Ref    |            |       |
| <1 unit                           | 0.74   | 0.51, 1.05 | 0.093 | 1.21   | 0.66, 2.20 | 0.536 |
| 1-2 units                         | 0.80   | 0.56, 1.16 | 0.242 | 1.14   | 0.63, 2.10 | 0.661 |
| 3-4 units                         | 1.06   | 0.71, 1.56 | 0.783 | 1.46   | 0.80, 2.68 | 0.220 |
| 5+ units                          | 1.07   | 0.71, 1.62 | 0.736 | 1.81   | 1.00, 3.29 | 0.051 |
| Mutually adjusted model           |        |            |       |        |            |       |
| Non drinker                       | Ref    |            |       | Ref    |            |       |
| <1 unit                           | 0.62   | 0.42, 0.91 | 0.015 | 1.56   | 0.82, 2.96 | 0.173 |
| 1-2 units                         | 0.63   | 0.42, 0.95 | 0.029 | 1.49   | 0.76, 2.88 | 0.243 |
| 3-4 units                         | 0.75   | 0.48, 1.17 | 0.209 | 1.90   | 0.97, 3.70 | 0.061 |
| 5+ units                          | 0.71   | 0.45, 1.14 | 0.161 | 2.28   | 1.17, 4.44 | 0.016 |
| Fully and mutually adjusted model |        |            |       |        |            |       |
| Non drinker                       | Ref    |            |       | Ref    |            |       |
| <1 unit                           | 0.64   | 0.43, 0.94 | 0.025 | 1.66   | 0.87, 3.15 | 0.123 |
| 1-2 units                         | 0.61   | 0.40, 0.93 | 0.020 | 1.55   | 0.80, 3.02 | 0.196 |
| 3-4 units                         | 0.73   | 0.47, 1.15 | 0.175 | 1.90   | 0.97, 3.72 | 0.061 |
| 5+ units                          | 0.63   | 0.39, 1.02 | 0.058 | 2.25   | 1.15, 4.41 | 0.018 |

Test for trend maternal and paternal alcohol intake in full model: p=0.795 and p=0.010

In the first trimester of gestation

|                                   | Mother |            |       | Father |            |       |
|-----------------------------------|--------|------------|-------|--------|------------|-------|
|                                   | OR     | 95% CI     | P     | OR     | 95% CI     | P     |
| Crude model                       |        |            |       |        |            |       |
| Non drinker                       | Ref    |            |       | Ref    |            |       |
| <1 unit                           | 0.87   | 0.69, 1.11 | 0.264 | 1.07   | 0.65, 1.78 | 0.785 |
| 1-2 units                         | 1.15   | 0.61, 2.17 | 0.658 | 1.05   | 0.63, 1.76 | 0.852 |
| 3-4 units                         | 2.24   | 0.99, 5.07 | 0.053 | 1.15   | 0.68, 1.96 | 0.596 |
| 5+ units                          | 1.07   | 0.27, 4.35 | 0.920 | 1.59   | 0.94, 2.68 | 0.083 |
| Mutually adjusted model           |        |            |       |        |            |       |
| Non drinker                       | Ref    |            |       | Ref    |            |       |
| <1 unit                           | 0.83   | 0.65, 1.05 | 0.126 | 1.10   | 0.66, 1.82 | 0.726 |
| 1-2 units                         | 1.05   | 0.56, 1.99 | 0.871 | 1.08   | 0.64, 1.82 | 0.769 |
| 3-4 units                         | 1.98   | 0.87, 4.49 | 0.104 | 1.20   | 0.71, 2.05 | 0.497 |
| 5+ units                          | 0.92   | 0.23, 3.74 | 0.908 | 1.61   | 0.95, 2.73 | 0.079 |
| Fully and mutually adjusted model |        |            |       |        |            |       |
| Non drinker                       | Ref    |            |       | Ref    |            |       |
| <1 unit                           | 0.83   | 0.65, 1.06 | 0.140 | 1.18   | 0.71, 1.98 | 0.523 |
| 1-2 units                         | 0.99   | 0.52, 1.88 | 0.967 | 1.14   | 0.67, 1.93 | 0.625 |
| 3-4 units                         | 1.81   | 0.79, 4.14 | 0.163 | 1.22   | 0.71, 2.10 | 0.467 |
| 5+ units                          | 0.79   | 0.19, 3.23 | 0.741 | 1.63   | 0.95, 2.80 | 0.077 |

Test for trend maternal and paternal alcohol intake in full model: p=0.981 and p=0.013

Supplementary Information, Table S16. Maternal and Paternal Average Alcohol Units per Week and Microcephaly at 3 Months Post-Partum – Odds Ratio (OR) and 95% Confidence Intervals (CI), MoBa data, Norway, 1999-2009.

Before pregnancy

|                                   | Mother |            |       | Father |            |       |
|-----------------------------------|--------|------------|-------|--------|------------|-------|
|                                   | OR     | 95% CI     | P     | OR     | 95% CI     | P     |
| Crude model                       |        |            |       |        |            |       |
| Non drinker                       | Ref    |            |       | Ref    |            |       |
| <1 unit                           | 1.10   | 0.83, 1.44 | 0.520 | 1.35   | 0.88, 2.08 | 0.175 |
| 1-2 units                         | 0.98   | 0.73, 1.30 | 0.867 | 1.34   | 0.87, 2.07 | 0.185 |
| 3-4 units                         | 1.06   | 0.77, 1.45 | 0.714 | 1.49   | 0.96, 2.32 | 0.072 |
| 5+ units                          | 1.13   | 0.81, 1.56 | 0.466 | 1.30   | 0.84, 2.02 | 0.239 |
| Mutually adjusted model           |        |            |       |        |            |       |
| Non drinker                       | Ref    |            |       | Ref    |            |       |
| <1 unit                           | 0.95   | 0.71, 1.29 | 0.750 | 1.42   | 0.89, 2.25 | 0.140 |
| 1-2 units                         | 0.83   | 0.60, 1.14 | 0.244 | 1.41   | 0.88, 2.27 | 0.157 |
| 3-4 units                         | 0.90   | 0.64, 1.28 | 0.561 | 1.60   | 0.98, 2.59 | 0.058 |
| 5+ units                          | 1.00   | 0.69, 1.44 | 0.982 | 1.36   | 0.83, 2.23 | 0.217 |
| Fully and mutually adjusted model |        |            |       |        |            |       |
| Non drinker                       | Ref    |            |       | Ref    |            |       |
| <1 unit                           | 1.00   | 0.74, 1.35 | 0.996 | 1.42   | 0.89, 2.27 | 0.137 |
| 1-2 units                         | 0.85   | 0.61, 1.17 | 0.312 | 1.41   | 0.87, 2.27 | 0.162 |
| 3-4 units                         | 0.95   | 0.66, 1.35 | 0.763 | 1.56   | 0.96, 2.53 | 0.074 |
| 5+ units                          | 0.97   | 0.67, 1.41 | 0.875 | 1.33   | 0.81, 2.18 | 0.255 |

Test for trend maternal and paternal alcohol intake in full model: p=0.804 and p=0.604

In the first trimester of gestation

|                                   | Mother |            |       | Father |            |       |
|-----------------------------------|--------|------------|-------|--------|------------|-------|
|                                   | OR     | 95% CI     | P     | OR     | 95% CI     | P     |
| Crude model                       |        |            |       |        |            |       |
| Non drinker                       | Ref    |            |       | Ref    |            |       |
| <1 unit                           | 0.85   | 0.71, 1.01 | 0.061 | 1.22   | 0.84, 1.78 | 0.290 |
| 1-2 units                         | 0.89   | 0.53, 1.50 | 0.669 | 1.15   | 0.79, 1.69 | 0.462 |
| 3-4 units                         | 0.96   | 0.39, 2.32 | 0.921 | 1.23   | 0.83, 1.82 | 0.291 |
| 5+ units                          | 2.27   | 1.12, 4.63 | 0.024 | 1.21   | 0.81, 1.80 | 0.356 |
| Mutually adjusted model           |        |            |       |        |            |       |
| Non drinker                       | Ref    |            |       | Ref    |            |       |
| <1 unit                           | 0.84   | 0.70, 1.00 | 0.047 | 1.24   | 0.86, 1.81 | 0.253 |
| 1-2 units                         | 0.89   | 0.53, 1.49 | 0.657 | 1.19   | 0.81, 1.75 | 0.373 |
| 3-4 units                         | 0.95   | 0.39, 2.31 | 0.905 | 1.27   | 0.86, 1.89 | 0.229 |
| 5+ units                          | 2.24   | 1.09, 4.58 | 0.027 | 1.25   | 0.84, 1.88 | 0.269 |
| Fully and mutually adjusted model |        |            |       |        |            |       |
| Non drinker                       | Ref    |            |       | Ref    |            |       |
| <1 unit                           | 0.83   | 0.70, 1.00 | 0.046 | 1.30   | 0.89, 1.90 | 0.176 |
| 1-2 units                         | 0.81   | 0.48, 1.37 | 0.438 | 1.23   | 0.84, 1.82 | 0.291 |
| 3-4 units                         | 0.87   | 0.36, 2.14 | 0.768 | 1.30   | 0.87, 1.94 | 0.203 |
| 5+ units                          | 1.93   | 0.94, 3.99 | 0.075 | 1.29   | 0.86, 1.95 | 0.222 |

Test for trend maternal and paternal alcohol intake in full model: p=0.343 and p=0.910

**Supplementary Information, Table S17. Associations of paternal alcohol drinking before pregnancy and microcephaly– odds ratio (OR) of microcephaly and 95% confidence intervals (CI) by categories of average alcohol dose per occasion, with several exclusion criteria.**

a) excluding all congenital malformations at birth

|                                   | At birth |            |       | At 3 months |            |       |
|-----------------------------------|----------|------------|-------|-------------|------------|-------|
|                                   | OR       | 95% CI     | p     | OR          | 95% CI     | p     |
| Fully and mutually adjusted model |          |            |       |             |            |       |
| Non drinker                       | Ref      |            |       | Ref         |            |       |
| <1 drink                          | 1.80     | 0.87, 3.72 | 0.113 | 1.56        | 0.90, 2.69 | 0.112 |
| 1-2 drinks                        | 1.41     | 0.73, 2.70 | 0.308 | 1.35        | 0.83, 2.20 | 0.229 |
| 3-4 drinks                        | 1.62     | 0.83, 3.12 | 0.155 | 1.60        | 0.98, 2.62 | 0.062 |
| 5+ drinks                         | 1.83     | 0.95, 3.52 | 0.070 | 1.56        | 0.95, 2.54 | 0.079 |

b) excluding Maternal pre-eclampsia, gestational diabetes, or unknown follow-up

|                                   | At birth |            |       | At 3 months |            |       |
|-----------------------------------|----------|------------|-------|-------------|------------|-------|
|                                   | OR       | 95% CI     | p     | OR          | 95% CI     | p     |
| Fully and mutually adjusted model |          |            |       |             |            |       |
| Non drinker                       |          |            |       |             |            |       |
| <1 drink                          | 1.62     | 0.78, 3.40 | 0.199 | 1.59        | 0.93, 2.71 | 0.090 |
| 1-2 drinks                        | 1.37     | 0.71, 2.65 | 0.348 | 1.25        | 0.77, 2.02 | 0.369 |
| 3-4 drinks                        | 1.43     | 0.71, 2.65 | 0.292 | 1.47        | 0.91, 2.39 | 0.118 |
| 5+ drinks                         | 1.70     | 0.74, 2.78 | 0.114 | 1.53        | 0.95, 2.49 | 0.083 |

c) excluding outliers HC more than 4 sd away, or mother-reported 'abnormal HC'

|                                   | At birth |            |       | At 3 months |            |       |
|-----------------------------------|----------|------------|-------|-------------|------------|-------|
|                                   | OR       | 95% CI     | p     | OR          | 95% CI     | p     |
| Fully and mutually adjusted model |          |            |       |             |            |       |
| Non drinker                       |          |            |       |             |            |       |
| <1 drink                          | 1.76     | 0.85, 3.65 | 0.130 | 1.49        | 0.88, 2.53 | 0.141 |
| 1-2 drinks                        | 1.48     | 0.77, 2.83 | 0.242 | 1.20        | 0.75, 1.93 | 0.451 |
| 3-4 drinks                        | 1.64     | 0.85, 3.16 | 0.141 | 1.38        | 0.86, 2.23 | 0.182 |
| 5+ drinks                         | 1.96     | 1.02, 3.76 | 0.043 | 1.44        | 0.90, 2.32 | 0.131 |

d) excluding C-sections

|                                   | At birth |            |       | At 3 months |            |       |
|-----------------------------------|----------|------------|-------|-------------|------------|-------|
|                                   | OR       | 95% CI     | p     | OR          | 95% CI     | p     |
| Fully and mutually adjusted model |          |            |       |             |            |       |
| Non drinker                       |          |            |       |             |            |       |
| <1 drink                          | 2.45     | 0.99, 6.08 | 0.053 | 1.44        | 0.82, 2.52 | 0.204 |
| 1-2 drinks                        | 1.79     | 0.77, 4.14 | 0.173 | 1.12        | 0.68, 1.85 | 0.659 |
| 3-4 drinks                        | 2.02     | 0.87, 4.70 | 0.102 | 1.32        | 0.79, 2.19 | 0.284 |
| 5+ drinks                         | 2.32     | 1.00, 5.35 | 0.049 | 1.44        | 0.87, 2.38 | 0.157 |

e) excluding mothers at risk or problem drinking (relative to year prior to pregnancy)

|                                   | At birth |            |       | At 3 months |            |       |
|-----------------------------------|----------|------------|-------|-------------|------------|-------|
|                                   | OR       | 95% CI     | p     | OR          | 95% CI     | p     |
| Fully and mutually adjusted model |          |            |       |             |            |       |
| Non drinker                       | Ref      |            |       | Ref         |            |       |
| <1 drink                          | 1.82     | 0.85, 3.89 | 0.125 | 1.60        | 0.94, 2.75 | 0.085 |
| 1-2 drinks                        | 1.65     | 0.84, 3.25 | 0.149 | 1.34        | 0.83, 2.16 | 0.239 |
| 3-4 drinks                        | 1.78     | 0.90, 3.54 | 0.098 | 1.61        | 0.99, 2.61 | 0.055 |
| 5+ drinks                         | 2.07     | 1.05, 4.08 | 0.037 | 1.49        | 0.91, 2.42 | 0.110 |

**Supplementary Information, Table S18. Associations of paternal alcohol drinking before pregnancy and microcephaly– odds ratio (OR) of microcephaly and 95% confidence intervals (CI) by categories of average alcohol dose per occasion, including all 68,098 eligible trios.**

|                          | At bi rth |            |       | At 3 mon ths |            |       |
|--------------------------|-----------|------------|-------|--------------|------------|-------|
|                          | OR        | 95% CI     | p     | OR           | 95% CI     | p     |
| Crude model              |           |            |       |              |            |       |
| Non dri nker             |           |            |       |              |            |       |
| <1 dri nk                | 1.20      | 0.71, 2.03 | 0.499 | 1.33         | 0.88, 2.00 | 0.172 |
| 1-2 dri nks              | 0.86      | 0.55, 1.34 | 0.516 | 1.16         | 0.82, 1.63 | 0.402 |
| 3-4 dri nks              | 1.01      | 0.65, 1.57 | 0.956 | 1.34         | 0.95, 1.89 | 0.095 |
| 5+ dri nks               | 1.33      | 0.87, 2.04 | 0.189 | 1.37         | 0.98, 1.91 | 0.070 |
| Mutu ally adjusted model |           |            |       |              |            |       |
| Non dri nker             |           |            |       |              |            |       |
| <1 dri nk                | 1.34      | 0.78, 2.33 | 0.292 | 1.41         | 0.92, 2.15 | 0.113 |
| 1-2 dri nks              | 1.00      | 0.62, 1.63 | 0.996 | 1.24         | 0.86, 1.81 | 0.255 |
| 3-4 dri nks              | 1.13      | 0.69, 1.84 | 0.627 | 1.44         | 0.99, 2.09 | 0.059 |
| 5+ dri nks               | 1.44      | 0.89, 2.33 | 0.138 | 1.51         | 1.04, 2.19 | 0.031 |

**Supplementary Information, Table S19. Associations of paternal alcohol drinking before pregnancy and microcephaly– odds ratio (OR) of microcephaly and 95% confidence intervals (CI) by categories of average alcohol dose per occasion, with additional adjustment for fetal presentation at birth.**

|                                      | At bi rth |            |       | At 3 mon ths |            |       |
|--------------------------------------|-----------|------------|-------|--------------|------------|-------|
|                                      | OR        | 95% CI     | p     | OR           | 95% CI     | p     |
| Fu l ly and mutu ally adjusted model |           |            |       |              |            |       |
| Non dri nker                         |           |            |       |              |            |       |
| <1 dri nk                            | 1.80      | 0.87, 3.71 | 0.114 | 1.61         | 0.95, 2.71 | 0.075 |
| 1-2 dri nks                          | 1.46      | 0.76, 2.81 | 0.254 | 1.25         | 0.78, 2.00 | 0.357 |
| 3-4 dri nks                          | 1.62      | 0.84, 3.13 | 0.148 | 1.45         | 0.90, 2.33 | 0.125 |
| 5+ dri nks                           | 1.90      | 0.99, 3.65 | 0.053 | 1.49         | 0.93, 2.39 | 0.100 |